Municipal and County Engineering

DESIGN, CONSTRUCTION, OPERATION AND MAINTENANCE OF ALL PUBLIC WORKS

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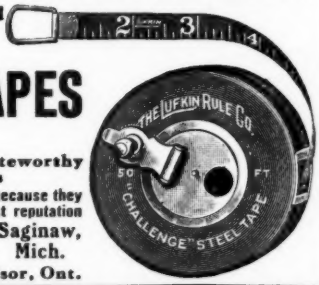

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EDITORIALS

THE UMPIRE

Rare pleasure was experienced in coming upon the following paragraph in an article published in this issue:

"When commerce brings together an aggregation of people to form a town, they, in order to live together harmoniously, elect a set of officers to umpire the game. There is no state constitution that gives to any city council any power other than that of an umpire."

Some may say that "referee" would be better than "umpire," contending that community life is rather more like a boxing or wrestling bout than a baseball game. The point is not one to detain us; "umpire" suits well enough.

The figure will please many and, perhaps, displease a few. We find much in it to admire and shall remember it, pleasantly, for many days to come.

The attitude of the public toward public officials is very much like its attitude toward baseball umpires. Each class is condemned on general principles as well as for specific acts of omission or commission. "The umpire is a most unhappy man," in the words of an old song. He is accused of almost everything except being honest and competent, whether he is umpiring community life or a ball game. The treatment accorded baseball umpires mars that otherwise great sport and the treatment accorded public officials is nothing short of a disgrace. Some people respect and admire the public official, it is true, and some followers of the great national game admire the umpire. Such admiration, however, is seldom expressed and is confined to a very small class, perhaps to those in the "box seats." Those in the "bleachers," in either game, life or baseball, are sure the umpire is dishonest and incompetent. When all the fans admire the umpire we may expect the public to accord decent treatment to public officials.

Umpiring is unpleasant in many ways; it may be dangerous. The umpire's rewards are not great, yet life as an umpire must have its compensations. Perhaps the veteran umpire, Tim Hurst, explained it when he said: "You can't beat them hours." The public official hasn't even the solace of short hours.

DRAFTING AND THE YOUNG ENGINEER

Progress in one great constructional activity waits on the young engineer. In at least one state highway department the production of modern highway bridges cannot be maintained at the desired rate because of the lack of men to get out the drawings; probably the same condition exists in some other state highway bridge departments. In the particular case in mind money is available for building bridges which cannot be built because young engineers, in many cases, insist on outside work and refuse to hump over the drafting board.

We are both glad and sorry that this is true; glad that the young engineer has declared his independence of the drafting room as a place to make a living, and sorry that he is unwilling to spend part of his time in drafting, not only because some designing experience is essential to his symmetrical development, but because his balking at the drafting room door is, to some extent, holding up the great highway development program. The young engineer now has an unusually favorable opportunity to alternate between design and construction in a way which should serve his comfort and convenience and speed his professional development and advancement. Time was when the young engineer bent over the board, until he was no longer young, expecting that his reward would come. The many disappointments experienced gradually found expression and the young engineers of today are much more sophisticated than were those of twenty or thirty years ago. Now they know it takes something more than long service and the willingness to wear darned trousers to achieve advancement. They have learned that the drafting room of the old days was only too often the graveyard of hope. While this is well and while it is very fortunate that young men have learned that they must

be alert for opportunities to advance it is really unfortunate that so many refuse to do any drafting at all, unfortunate for them and for the public. They have gone from one extreme to the other. Probably they will settle down soon to a middle-of-the-road course, dividing their early years between design and construction.

INCREASING FRANKNESS IN CRITICISM OF ENGINEERS

One of the most encouraging signs observed in many years' study of engineers and engineering is the increasing frankness of engineers in their self-criticism. Self study is supplanting self pity to the inevitable advantage of engineers. The pharisaical thanking God that we are not as other men are is giving way to the recognition of the fact that we are members of the human family after all and that if we expect to get along we must adopt the methods of successful men in other lines of work. The "holier than thou" philosophy was discredited long ago and it is rather naive for the engineer to cling to it still.

One of the frankest criticisms of the engineer that has yet appeared is published in the August number of "Professional Engineer," the official journal of the American Association of Engineers. It is from an address by Mr. E. T. Tannatt before the Tacoma Chapter.

He feels that the engineer is severely handicapped by the weight of the "thou shalt nots" he is obliged to carry. He illustrates by saying that if a child is reared from birth in the spirit of "thou shalt not" and in the belief that he is too blue-blooded to associate with other children, that on reaching manhood he will strongly manifest the very characteristics for which engineers have been criticized as a profession. Mr. Tannatt says: "If you will take any code of ethics as laid down for the engineer, and I do not except that distributed by our own Association, you will find that practically every item conveys to your mind (possibly only in a very subtle way) one of two impressions—either that your profession is so 'blue-blooded' as to be above association with the common humanity or business callings, or that 'thou shalt not.' If I am not very much mistaken, you will find that these 'thou shalt nots' almost invariably place over the engineer a dictum that prevents him from taking part in some line of service or opportunity in which he is especially qualified to succeed; also that the same code is not made to apply to business, even when the business world is dealing with identically the same engineering problems."

He cites many reasons for his beliefs, based on things as they are, and concludes as follows: "Just so long as the profession is willing to live by creeds and dogmas and considers itself too good to enter business life in a business way, just so long will the profession be what it is today, namely, no profession at all, and one of the poorest-paid vocations."

THE PERSECUTION OF THE ARMY CONSTRUCTION PROGRAM MEN

In this issue we publish an article giving the truth about cantonment construction costs which is worth reading and preserving. The author is very indignant, and properly so, about the persecution started by Attorney-General Daugherty against the engineers and contractors of the army construction program. The entire construction industry is indignant because of this persecution of some of its most respected members. What can we do about it?

The answer is easy. Simply serve notice on the new President, through our engineer friend, Secretary Hoover, or in any other convenient way, that the construction industry realizes that these suits were filed as a party measure, and that unless they are withdrawn and the accused men exonerated, the construction industry will voice its protest at the polls. This is an argument any administration can understand, especially one that has only a few months in which to make a record on which it can go to the people for approval.

We believe the truth with respect to these charges is very adequately expressed in an editorial in a recent issue of Engineering News-Record, in these words: "The whole history of the Construction Division suits and indictments, from the strictly partisan Congressional investigation to the personnel of the staff which is using that investigation as its bible, brands that persecution with political motives. It was plainly an effort to magnify the new administration by discrediting the Wilson administration. Reputable engineers and contractors were to be made martyrs in the process." That is the plain truth, plainly stated.

ILLINOIS TO MAKE EXTENSIVE INVESTIGATION IN SUBGRADES

By H. F. Clemmer, Engineer of Materials, Illinois Division of Highways, State House, Springfield, Ill.

Realizing that the strength of pavement sections is influenced to a great extent by the soil making up the subgrade under these pavements, the Illinois Division of Highways is planning an extensive investigation in soils to study as far as possible the many factors which cause one type of soil to provide better support than others.

Soil Survey Reveals 14 Distinct Types in Illinois

Three years of investigation on the Bates Experimental Road has provided an immense volume of data on the actions and characteristics of the soil making up the subgrade of that road. Bearing power tests, moisture content determinations, soil movements and other tests of this nature revealed the fact that the Bates Road subgrade, consisting of soil commonly known as brown silt loam, furnishes very little support to the pavement slabs at certain times of the year. Though the tests on this type of soil were most complete, the fact that the soil over the State of Illinois is not of a uniform nature makes it impossible to apply the knowledge gained on the Bates Road to all soils making up the subgrade of the State highway system. For this reason it was decided to make a survey of the soils in the State and then subject the different types of soil to various tests. The survey revealed the presence of 14 distinct types of soils.

Planning the Tests

In order to centralize the investigation and in this way make it possible to build more permanent apparatus, it was decided to transplant the different soil samples to the Research Laboratory at Springfield. Samples of these 14 typical types of soil were therefore shipped to Springfield and placed in holes in the ground, 18 ins. deep and 2 ft. square. A concrete curb 6 ins. deep was placed around the specimens and level with the surface of the ground. A 2-in. concrete cover was fitted into this curb and the crack at the junction sealed with asphalt. The purpose of the cover was to prevent the entrance of rain water to the surface of the soil specimens. Through sampling stations in the covers small soil samples are secured at regular intervals for moisture determinations. Figure 1 shows a general view of the layout of the specimens.

Moisture Determinations

The soil specimens were placed in the ground in January of this year and were left undisturbed except for weekly moisture determinations until May 29. Ditches dug down each side of the row of specimens were filled with water on May 29

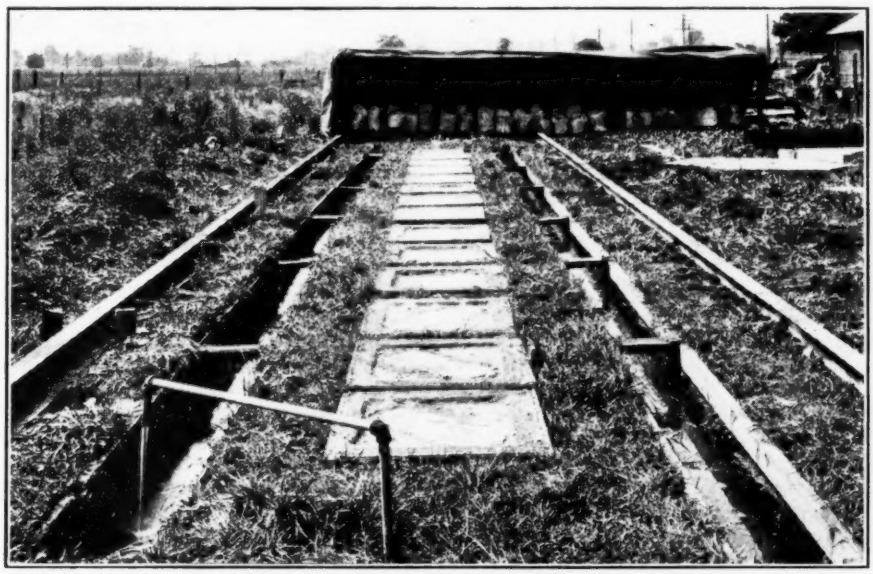


FIG. 1—GENERAL VIEW OF LAYOUT OF SOIL SPECIMENS IN ILLINOIS SUBGRADE EXPERIMENTS

in order to secure a condition similar to the side ditches of a pavement. The studies in soil at the Bates Road showed an extremely small amount of lateral movement of water in brown silt loam soil. The effect of this condition on the soils of other types is to be watched with interest. The moisture contents of the various types run from 45 per cent to 14 per cent of the dry weight of the soil. As all conditions surrounding the placement and treatment of these samples were alike, this great variation in moisture content cannot be due to anything else but the nature of the soils themselves.

Laboratory Tests Being Made

Laboratory tests are now being made to determine the effect of free water, capillary water, surface wetting and colloidal elements on these soils. Before the tests are entirely completed it is hoped that a complete analysis of the various types of soil will have been made. Figure 2 contains a view of the samples prepared for laboratory tests.

Bearing Power Tests

An apparatus is at present being built in the laboratory for use in the bearing power tests. This machine is expected to be capable of applying loads of from 1 lb. to 50 lbs. per sq. in. over a relatively large area. It will be mounted on tracks so that it can be moved up and down the row of soil samples and apply loads where desired.

Types of Soils Tested

The types of soils included in the tests are as follows:

Sample *No. 1.* Sangamon County. Yellow Gray Silt Loam—Backland timber soil. Sample taken Oct. 23, 1922, at intersection of roads, 1¼ mi. E. of Sherman. No sharp line of demarkation between topsoil and substructure. Sample of mealy and silty character. Subsoil more granular and becoming more clayey as depth increases.

Sample *No. 2.* Sangamon County. Deep Brown Silt Loam—Bottom land soil. Sample taken Oct. 24, 1922, at road intersection ¼ mi. N. of Chickapin Bridge on Chickapin road, approximately 5 miles N. of Springfield. No sharp line of demarkation between topsoil and subsoil. Sample almost black and granular; subsoil becoming lighter and still more granular with depth.

Sample *No. 3.* Sangamon County. Black Clay Loam—"Gumbo"—Sticky black prairie soil. Sample taken Oct. 26, 1922, 3⅛ mi. S. and 4 mi. W. of Pleasant Plains. Sample taken to depth of 12 ins. Topsoil very black, sticky and granular when dry —very difficult to work. Subsoil becomes lighter with depth passing into drab or yellowish clay.

Sample *No. 4.* Sangamon County. Brown Silt Loam—Upland prairie soil. Sample taken Oct. 26, 1922, at road intersection 2¼ mi. W. and 1¾ mi. N. of Bradforton. This is the most important and extensive type of soil in the central part of the State and occupies most of the well-drained prairie areas.

Sample *No. 5.* Sangamon County. Drab and Yellow Clay. Sample taken Oct. 26, 1922, at same location as Sample No. 4, but at a depth of 24 to 36 ins.

Sample *No. 6.* Pike County. Yellow Silt Loam—Upland timber soil. Sample taken Oct. 31, 1922, at a point along the road 1¼ mi. N. and ¾ mi. E. of the village of New Salem in Pike County. Sample taken to a depth of 12 ins. This soil occurs on very hilly and badly eroded areas. It is a silty mealy soil which works easily. Subsoil is yellow clay.

Sample *No. 7.* Pike County. Fine Sandy Loam—Upland timber soil. Sample taken Oct. 31, 1922, at a point along the roadside 2½ mi. E. of the city limits of Griggsville, Pike County, and 1 mi. W. of the village of Valley City. Sample taken to a depth of 12 ins. This soil occurs on the very rolling and broken areas. It is of a sandy character and very easily worked. Subsoil is yellow clay.

Sample *No. 8.* Pike County. Brown Sandy Loam—Old bottom land. Sample taken Nov. 3, 1922, at a point along the roadside 1½ mi. E. and 1¼ mi. N. of the village of Chambersbury in Pike County. Sample taken to a depth of 12 ins. This type occurs adjacent to the Illinois and Mississippi Rivers, on areas not subjected to overflow. It is of sandy, easy working character. Subsoil very sandy.

Sample *No. 9.* Pike County. Drab Clay —Swamp land soil. Sample taken Nov. 3, 1922, at a point along the roadside ½ mi. W. of bridge over the Illinois River at Meredosha near subway underneath the Wabash Railway. Sample taken to a depth of 12 ins. This type occurs on the uncultivated, swampy, back-water areas adjacent to the Illinois and Mississippi Rivers. It is drab to black in color and very sticky and difficult to work. Surface cracks 2-in. wide and 1 ft. to 2 ft. deep were present at the point where the sample was taken. The subsoil is similar to the topsoil, underlaid at lower depths with sand.

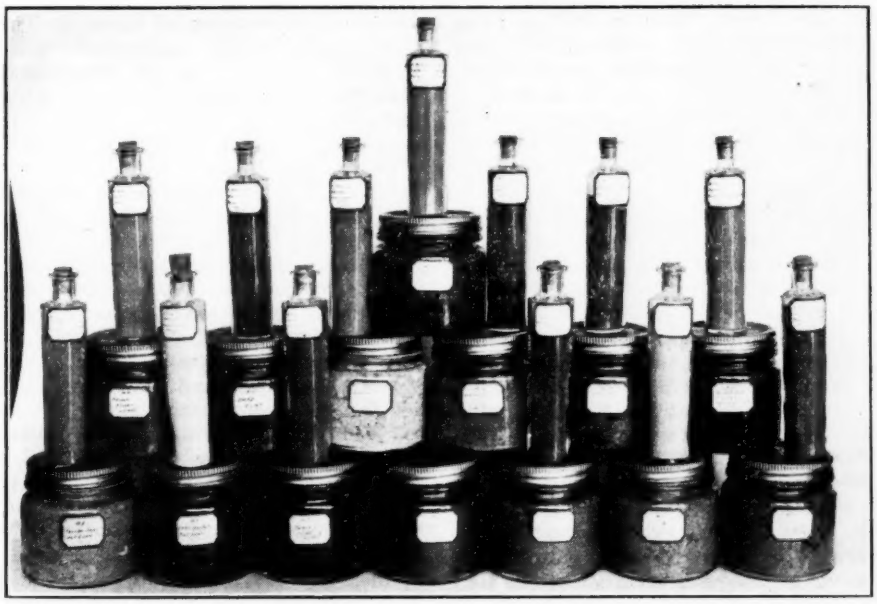


FIG. 2—VIEW OF SOIL SAMPLES PREPARED FOR LABORATORY TESTS, ILLINOIS SUBGRADE EXPERIMENTS

Sample *No. 10.* Bond County. White Silt Loam—Upland timber soil. Also known as "post oak" soil because of the scrub oak which grows on this soil. Sample taken Nov. 9, 1922, at a point on the roadside 2½ mi. N. and 1¼ mi. W. of Old Ripley Post Office in Bond County. Sample taken to depth of 6 ins. The soil is highly silty and looks like wood ashes. Subsoil same as Sample No. 12.

Sample *No. 11.* Bond County. Gray Silt Loam on Hard Pan—Upland prairie soil. Sample taken Nov. 9, 1922, at a point on roadside 2¼ mi. S. and 1 mile E. of the S. W. corner of the city limits of Greenville in Bond County. This is a friable, highly silty loam containing enough clay to make it slightly plastic when wet. Subsoil same as Sample No. 12.

Sample *No. 12.* Bond County. Subsoil. Sample taken Nov. 9, 1922, at location as Sample No. 11. Sample taken to depth of 18 ins. This is a very sticky gummy clay when wet and very hard when dry.

Sample *No. 13.* Sangamon County. Black Clay Loam. Sample taken about Jan. 15, 1923, at Bates Experimental Road. This sample is typical of central Illinois prairie soil.

Sample *No. 14.* Winnebago County. Brown Sandy Loam—Upland prairie soil. Sample taken Jan. 19, 1923, at point on roadside 2 mi. W. of Rockford in Winnebago County. Sample taken to depth of 18 ins.

NEW GARBAGE INCINERATING PLANT ON CHOUTEAU AVE., ST. LOUIS, MISSOURI

(Editor's Note: The following description of the new garbage incinerating plant at the foot of Chouteau Ave., St. Louis, Mo., is from a report on the garbage situation in St. Louis from 1839 to date. The report was written by C. S. Butts, engineer of the Department of Public Utilities, 311 City Hall, St. Louis.)

The Board of Public Service was authorized by Ordinance No. 31494, Feb. 6, 1922, to advertise for bids for two incinerator plants, one at Kingshighway and McRee and one at the foot of Chouteau Ave., and appropriating $140,000 for this purpose. The contract for the Chouteau Ave. plant was awarded May 19, 1922, to the Chicago Incinerator Co. at $69,812. Work commenced June 14, 1922, and was completed Nov. 1, 1922.

There were 68,354 tons of garbage collected during 1922-1923 at a cost of $3.55 per ton. The cost of disposal was $1.60 per ton, or a total cost of $5.15 per ton of garbage. A total of 11,857 dead animals of all kinds was disposed of.

All garbage with the exception of 80 tons per day hauled to the incinerator plant, is being hauled to the present contractors, Klein & Katz, and weighed and dumped onto barges at the foot of Chou-

teau Ave. There are some 130 wagons in service during the summer months, hauling garbage to this point, which, based on 1922-1923 reports, costs $3.55 per ton for hauling and $2.10 for disposal, makes $5.65 per ton. The present wagons weigh about 2,500 lbs. and haul about 1¼ tons of garbage, making the total weight of load 5,000 lbs., or 2½ tons.

The hauling of garbage by motor trucks seems to be the solution of the collection problem. Experiments are now being made by trucks and trailers. This system has reduced the cost of collection, but has not eliminated the mule-driven wagon. A system should be devised whereby collection can be made by tractor and trailer and eliminate the wagons and mules.

There should be 5 incinerators built, 3 of 100 tons capacity on the river and 2 of 150 tons capacity in the central west end, thus reducing the long haul which will greatly reduce the cost of collection during the summer, when about 400 tons per day are collected. The plants would have to be operated 24 hours each day, but during the winter months, when 150 tons are collected, would only have to be operated 8 hours each day.

When the incinerator plants are all complete and in operation, an ordinance should be enacted requiring all garbage to be drained and wrapped in paper before being deposited in the garbage can. This would increase the efficiency of the incinerator plants and eliminate sloppy garbage being hauled through the streets. There should also be an ordinance enacted requiring all hotels to put in their own incinerator plants in their buildings; also all large apartments should be required to put in incinerator plants in their buildings and garbage collected daily by janitor and burned in their own incinerator plant.

It may be seen by following the ordinances and contracts from 1839 until 1923 that most all methods were tried out in St. Louis to dispose of garbage. From 1839 until 1910 it was dumped into the Mississippi River, but from that date until the present it had a hard time finding a place to light, as the government stopped the authorities from dumping garbage into the river.

The reduction method was tried out here first at the foot of Osage St., then Wright and Hall Sts., then in St. Louis County near St. Louis and finally in Illinois, near Dupo, this being the last reduction plant. The public, in general, always objected to the odor and finally drove this method out of business. Then came the hauling of garbage to Chelsey Island by barge, where it was dumped upon the island and fed to hogs (what they did not eat was plowed under the ground). Later it was disposed of by contract to contractors who hauled it to Stallings, Ill., and later to Summit, Mo., and it is now being disposed of to contractors who haul it down the river; it is sold to farmers for feeding hogs. In other words, we are almost back where we started in 1839, as no successful disposal has been found up to this time. We believe we have at last taken a step in the right direction and have built an 80-ton capacity incinerator plant at the foot of Chouteau Ave. (This site was selected probably because the mules were so familiar with this location that they would not feel at home any place else.) We base our conclusion regarding incineration on data that have been gathered regarding incinerators and upon what is being done here and in foreign countries.

It was only after the reduction method had been tried and failed in England that incineration was adopted there, and today there is not one municipal reduction plant in England, so far as I have been able to ascertain, while there are 143 municipal incinerating plants in successful operation. In addition to the above number of incinerating plants in England alone, the three principal cities of Scotland, and the eight large cities of Ireland dispose of their entire refuse by incineration. There is not a large city in Europe, South America, Africa, India, or Australia which does not do likewise. Owing to the prevalence of cholera in the far eastern countries, the question of the collection and disposal of garbage was given for years their most careful consideration, and the incinerating method finally adopted. Both Calcutta and Bombay, India, employ incineration for the disposal of their garbage with perfect satisfaction.

Official reports show conclusively that the reduction process has been a failure in every city in this country which has tried it, and especially so in Denver, St. Paul, Buffalo, Chicago, Milwaukee, Detroit, New Bedford, Reading, Pittsburgh, Syracuse, Paterson and New Orleans.

The refuse of the average American city is of the following composition:

	By Wt.	By Vol.
Garbage	13 per cent	18 per cent.
Ashes	80 per cent	57 per cent
Rubbish	7 per cent	25 per cent
	100 per cent	100 per cent

Ordinary kitchen garbage consists approximately of:

	By Wt.
Animal and vegetable	20 per cent
Rubbish, cans, rags, etc.	7 per cent
Grease	3 per cent
Water	70 per cent
	100 per cent

A description of the new 80-ton incinerator plant at the foot of Chouteau Ave. follows:

Foundation:—The foundation consists of forty-nine 20-ft. reinforced, pre-cast concrete piles, driven to an elevation of 95.5 being 6 ins. in the concrete footings, which are constructed to an elevation of 103.2, 1 ft. above the operating room floor level.

Building:—The outside dimensions of the building are 38x56 ft. 1 in., built of brick with steel truss roof. The operating floor is on an elevation of 102.2, being 36 on river gauge.

Operating Floor:—A small office 8x12 ft. and a wash and toilet room, 6x12 ft. with shower are on this floor. Three furnaces (including combustion chamber) 14 ft. 9 ins. wide by 32 ft. long by 11 ft. 6 ins. high are built on this floor. Two forced draft fans, one 10 h.p. and one 20 h.p., are placed on the floor at the north end of the furnaces for furnishing the furnaces with forced draft.

Tipping Floor:—The tipping floor is built on an elevation of 123.2. There are 3 holes 3x3 ft. and 3 holes 1 ft. 6 ins. by 4 ft., which the garbage is dumped into and goes directly into a storage bin (the entire length of furnaces) which is triangular shaped 9 ft. 6 ins. deep with capacity for 60 tons of garbage. Another hole 5 ft. 6½ ins. by 4 ft. 2 ins. is left directly over the combustion chamber for cinerating dead animals. There are also two coal holes 1 ft. 6 ins. by 2 ft. each, for dumping coal into chutes which empty on the operating floor in front of the furnaces.

Clinker Pits:—There are two tracks 24-in. gauge with dump cars to receive the clinkers from the furnaces and dust from the combustion chambers. The space occupied by pits is 11 ft. 6 ins. wide by 32 ft. long and 7 ft. high. These tracks lead out of the south end of the building, thence to the river bank.

Trestle Approach:—The trestle approach leads out of double doors on the tipping floor to the south. The entrance to the plant is by Convent St. A scale is located on the approach direct to tipping floor. A 5 ft. by 125 ft. radial brick chimney is built upon twenty-five 25-ft. pre-cast concrete piles and a reinforced concrete slab 17 ft. by 17 ft. by 4 ft.; chimney is lined with fire brick, 9 ins. for 50 ft. and 4½ ins. for 55 ft., making a total of 105 ft. of lining.

Operation of Plant:—The garbage is hauled up the incline, passing over scales, where it is weighed, thence into the south end of building onto the tipping floor, where it is dumped in holes in the floor into a large storage bin holding about 60 tons. There are 6 openings left in the east side of the bin with steel doors operated by pulleys and weights. Immediately opposite each door is a hole 2 ft. 1 in. in diameter closed by a cone-shaped weight which is also operated by pulleys. Outside of this hole are other steel doors making a closed air lock. The garbage is raked from the storage bin into the 2-ft. 1-in. opening at the top of the furnace, thence diverted onto a drying arch, from which it is raked onto side grates, where it is further dried, thence raked into the fire box of the furnace. The side grates are 5 ft. long by 3 ft. 6 in. wide. The fire box proper is 2 ft. 3 ins. wide, 1 ft. 3 ins. deep and 5 ft. long, making a total of about 60 sq. ft. of grate surface. After garbage is burned the ashes and clinkers are drawn into an ash bin and when cooled off are loaded into small cars in the basement of the plant and dumped in the river. The furnaces are operated with forced draft being supplied by two fans, one 10 h.p. and one 20 h.p.; the air to supply these fans is taken out of each of the 3 ash bins, over the hot clinkers into a 20-in. vitrified pipe, then into an air chamber 3x6 ft., thence through the fans into two galvanized air-tight ducts, one 1 ft. 6 ins. by 2 ft., and one 1 ft. 6 ins. by 3 ft. under the furnaces. Air is also taken out of the garbage bin through a 20-in. galvanized pipe through the fans and into the ducts. Under each furnace and directly under the grates are three 12-in. diameter holes in the ducts. Two of these holes supply air to the side grates and one to the fire box, the supply of air being regulated by dampers over each hole. The fans are so connected and the dampers so located in the air pipes proper that they can draw from ash pits, combustion chamber and garbage bin or separately and can be operated singly or together. The gases from the furnaces pass through a large combustion chamber where a temperature of about 1,200 deg. is maintained. Dead animals can be cinerated in this chamber. The chamber is connected to the chimney

which is 5 ft. in diameter by 125 ft high. All gases and bad odors disappear before reaching the top of the chimney.

In connection with the plant, a 280-gal. tank is provided for hot water and is supplied by two 2-in. pipes placed in the combustion chamber. This hot water furnishes two radiators in the office and the toilet rooms and also furnishes hot water on the tipping floor and firing floor for cleaning purposes.

The building was constructed by local contractors and the furnaces were constructed by the Burke Furnace Company of Chicago, to whom credit is due for the increased capacity of the plant. The plant is being operated by the Department of Streets and Sewers, Clinton H. Fiske, director.

Guarantee:—The guarantee made was as follows: To incinerate 80 tons of garbage in 24 hours without any nuisance or mal odors. To use not over 8 K.W. electricity for forced draft fans per ton of garbage. Tests show that this capacity has been raised to at least 100 tons in 24 hours and that it requires less than 1 K.W. electricity for each ton of garbage and less than 100 lbs. of coal per ton of garbage. It has therefore more than fulfilled the guarantee.

The plant is being operated 24 hours per day in three 8-hr. shifts and requires 3 men on the firing floor, 3 on charging floor and 1 foreman for each 8-hr. shift, and is incinerating garbage without any offensive odors or smoke for $1.00 per ton, or showing a saving of $1.10 per ton over the present contract of dumping it on barges at $2.10 per ton.

It is the intention of the city to erect the other plants as soon as possible, thus eliminating the long haul to this one plant and further reducing the cost of collection.

This plant has been in operation for 5 months and as yet no complaint has been made against this method of disposal of garbage. After 84 years of garbage disposal troubles it is believed that the city has found the proper solution of the disposal of garbage in a sanitary manner.

"OPEN" VS. "CLOSED" SPECIFICATIONS FOR ASPHALT RESURFACING

By C. R. Andrew, City Engineer, Decatur, Ill.

(Editor's Note: The following paper by Mr. Andrew and the discussion of it by Mr. Hittell are reproduced here from the published proceedings of the Illinois Society of Engineers, Inc., for the year 1923).

First, I wish to define the words "open" and "closed" as applied to specifications in this portion of the discussion. By open specifications I mean specifications that are open in a practical and not a legal sense; specifications which will admit the products of a considerable number of competing firms, but not specifications which will necessarily admit all the products of all the firms supplying asphalt. By closed specifications, I mean those specifications which are so written that they will admit the actual (not the possible) use of products of one firm or its subsidiaries. These specifications may be open in a legal sense, as it is possible that in other countries, or in other parts of this country, there may be independent firms manufacturing or producing a product which would fulfill the specifications, but in the particular case in question it would not be practical or perhaps possible for them to do so. With these two definitions in mind I will briefly give you the experience of the city of Decatur in obtaining bids under both "open" and "closed" specifications for sheet asphalt surface on both new work and resurfacing over old two course brick pavements.

In 1921 the city of Decatur inaugurated a considerable program of asphalt resurfacing. This program consisted of about 100,000 sq. yds. of asphalt pavement, the majority of which was resurfacing over old brick, 80,000 yds. of which was under contract during the season. This program was indorsed by the local Association of Commerce and various local clubs. The recommendations of the Association of Commerce were that the asphalt was to be equal to "Trinidad." Specifications were drawn which would practically permit the use of no other asphalt than natural lake asphalt. The fact that no other asphalt was practical under the specifications is evidenced by the fact that when the bids were received none but Trinidad asphalt was bid upon.

The work consisted of closed binder, at least 1½ in. thick with a 1½ in. wearing surface over old brick surface. One project of about 15,000 yds, was advertised. Five bids were received and the prices for that portion requiring asphalt were as follows: For 1½ in. binder and 1½ in. wearing course, from $1.74 to $2.155, and for extra binder $11.90 to $12 per ton. The engineer's estimate was $2.20 for

asphalt surface and $12 per ton for extra binder. For reasons which were not of interest from a purely technical viewpoint, the commissioners decided to reject all bids and instructed the engineer to draw up specifications which would admit a larger number of asphalts; in fact, to write *open* specifications. This was done and four projects amounting to about 40,000 sq. yds. were advertised for bids. At this letting four bids were received, and the prices ranged from $1.20 to $1.73 for the asphalt surface, and for the extra binder from $10 to $12 per ton.

At the request of one of the leading firms supplying asphalt, a clause was inserted in the bidding blanks permitting the contractors to bid on more than one brand of asphalt. The lowest bidder submitted two bids; one using so-called oil asphalt, and another Trinidad Lake asphalt. His bid for Trinidad was $1.44 per sq. yd. Note that under closed specifications the lowest bid for Trinidad was $1.73. Under open specifications, using the same material, the lowest price was $1.44. Another point which may not be directly attributed to the effect of open specifications the lowest bidder submitted lower prices for what we might call the accessories; that is, curb and gutter, drain tile, manholes, catch basins, etc. All of this meant a great saving to property owners.

Later in the season but before any work had been actually started, the remaining 40,000 yds. was advertised and at this bidding the price for asphalt surface ranged from $1.35 to $1.65 and for extra binder from $10 to $12 per ton. This was all the bidding during the season and about 60,000 yds. was completed, leaving 20,000 yds. for work as soon as the weather permits, in the spring. I have made a tabulation of one of the projects to show the difference in the cost under the various bids received during the season. This particular project contained 14,787 sq. yds. Its actual cost, constructed under price obtained at third bidding, was $36,604.90 or $2.47 per sq. yd. For this tabulation I have taken the actual amount of material used:

Lowest bid, closed specification	$42,147.23
Lowest bid, open specification, oil asphalt	33,652.05
Saving ($0.565 per sq. yd.)	$ 8,495.18
Lowest bid, closed specifications	$42,147.23
Lowest bid, open specifications, Trinidad	36,905.19
Saving ($0.35 per sq. yd.)	$ 5,242.04

The following discussion of Mr. Andrew's paper is by John B. Hittell, Chief Street Engineer, Board of Local Improvements, city of Chicago:

All authorities agree that asphalt originates in petroleum, and there is no difference whether the asphalt occurs in solution and is obtained through a steel pipe, as in Mexico and the United States, or if it exudes through a fissure in the earth in the form of a heavy oil, and is spread over the savannah to a depth of from 2 to 9 ft. and an area of a thousand acres, as in Venezuela; or whether it issues through a mass of fine mineral matter contained in what is presumed to be the crater of an extinct volcano, as in Trinidad.

The dominant requirements of an asphalt cement are that it should be adhesive, cohesive, not vary too much in ductility under different temperature ranges, have permeability under all weather conditions, and otherwise be not affected by the elements. Who can say that the bitumen of any asphalt is superior over the others when these requirements are taken into consideration? In fact, the influence of the kind of bitumen as to its effect upon the character and the stability of the wearing surface has been greatly overrated. Mr. Wallace L. Caldwell, of the Pittsburgh Testing Laboratory, after an examination of the causes of failures of bituminous wearing surfaces, exclusive of failures due to foundations, stated that those due to the unsuitability of the bitumen were but five per cent, the remaining causes being divided among the factors of workmanship, grading of the mineral aggregate, weather conditions, plant operations, and improper ductility.

In contravention of the word manufacture, there is no such article as a natural asphalt. To manufacture means to take a raw material and by some process make it a finished or useful article. The so-called natural asphalts, Trinidad and Bermudez, go through two processes before they can be incorporated in a paving mixture. The first is that of refining wherein the light oils and extraneous materials are driven off as much as commercially possible, and the second when these refined asphalts are fluxed with a petroleum oil to make them into asphalt cements. Asphalts obtained from petroleum go through but one process, namely, that of driving off the lighter oils until the residue has reached the desired consistency.

Service and use, however, to a great

extent determine the value of an article. Since the petroleum oil asphalts are put on a parity with the so-called native or natural asphalts by all the leading technical societies in the United States, every large city in the Union, the state highway departments using asphalt, and the U. S. Bureau of Public Roads, and furthermore, since their consumption is about ten times that of the Bermudez and Trinidad combined, there seems to be no reason why those in authority should not adopt an open specification and reap the benefits of genuine competition, without impairing the quality of the pavement.

THE LEGAL STATUS OF MUNICIPAL COAL AND WOOD YARDS

By Joseph N. Moonan of Moonan & Moonan, Attorneys at Law, Waseca, Minn.

(Editor's Note: The right of a municipality to engage in the retail fuel business has been questioned. A case sometimes cited in support of this contention is that of the State ex rel. Kansas City v. Orear, 210 S. W. 392 (the Kansas City Ice Case) in which an express charter provision authorizing the City to engage in the business of making and selling ice was held to be invalid. Some held that the view of the Missouri Supreme Court is supported by the weight of authority. The question involved was stated in the Opinion in the Missouri case as follows: "May a town or city in this State, its charter permitting, lawfully engage in the business of making and selling ice to the inhabitants of such city?" A Missouri constitutional provision is: "Taxes may be levied and collected for public purposes only." The Missouri Court answered its question with: "No." It is this answer which some contend is supported by the weight of judicial authority. Some hold that it is beyond the power of a municipal corporation to engage in the sale of commodities which are and can be easily conducted by private business concerns in competition with one another, and which can be sufficiently regulated thereby, except during emergencies when a municipal corporation may buy and sell commodities of any sort as an agent for the relief of the community. Those who hold this view believe that a municipality can not legally engage in the sale of fuel to its inhabitants at retail, and that a statute or charter provision authorizing it to do so violates the constitutional provision prohibiting the use of the taxing power for a private enterprise. The author of the present article does not agree that the foregoing contentions are supported by the weight of judicial authority at the present time, and he gives the reasons on which his views are based.)

The question of the right of a city to engage in the sale of coal at retail was first considered by a court in the opinion of the Justices of the Supreme Court of Massachusetts in 1892 reported in 30 N. E. 1142. This and the subsequent opinions of the Massachusetts Court were not decisions but merely advisory opinions not having the force of a decision. From the opinion rendered in 1892 Justice Oliver Wendell Holmes dissented saying:

"I am of the opinion that when money is taken to enable a public body to offer to the public, without discrimination, an article of general necessity, the purpose is no less public when it is water or gas or electricity or education, to say nothing of cases like the support of paupers, or the taking of land for railroads or public markets.

"I see no ground for denying the power of the legislature to enact the laws mentioned in the questions proposed. The need or expediency of such legislation is not for us to consider."

The only case decided by any court which supports the conclusion of those opposed to a municipal coal yard is the case of Baker vs. City of Grand Rapids reported in 106 N. W. 208 wherein the Michigan Court held:

"A municipality, however, cannot enter into a commercial enterprise, such as buying and selling coal to its citizens as a business, thereby entering into competition with dealers in coal. Such use of moneys is held not to be for a public purpose. Opinion of the Justices, 155 Mass. 601, 30 N. E. 1142, 15 L. R. A. 809, and cases cited."

This decision of the Michigan Court has been overruled in principle by that court in a later case of Andrews vs. City of South Haven, 153 N. W. 827. On page 830 of the opinion of that case the Michigan Court said:

"We are past the general question of the validity of legislation authorizing municipal ownership and operation of plants and their necessary equipment to furnish the concentrated population of cities with certain general needs and conveniences, like water, light, heat, transportation, telephone service, etc.; and it is held that

the court will not interfere with any reasonable exercise of the implied powers to operate such plants in a business way, and as any private corporation could or would."

And on page 829 of the opinion the following appears:

"The question raised here relates only to the proprietary or business powers of the city, by means of which it may act and contract for its own private advantage and that of its inhabitants combined. In the exercise of the latter powers, the municipality, acting through its officers, is governed by the same rules which control a private individual or business corporation under like circumstances. Omaha Water Power Co. vs. City of Omaha, 147 Fed. 1, 77 C. C. A. 267, 12 L. R. A. (NS) 736, 8 Ann. Cas. 614. In such case the fact that a city engaging in a certain line of activity, commercial in its nature, competes with and thereby damages one of its inhabitants in his business, does not entitle him to relief, for the city owes him no immunity from competition."

On page 830 of the opinion the court cites with approval the case of Holton vs. Camilla, 134 Georgia, 560, wherein it was held that a city had the right to embark in the business of manufacturing and dealing in ice, and in the decision in the Andrews case the Michigan Court held that the city had the right to sell and install electric light fixtures, bulbs, wire and wiring. The court did not overlook the Baker case because it is cited on another point on page 831 of the opinion but was not considered by the court on the question of the authority of the city to engage in the business. So it will be seen that the court that decided the Baker case does not any longer consider it an authority. This is the only decided case which holds a city cannot engage in the fuel business and this case had never been followed by any other court.

In the case of Laughlin vs. Portland, 111 Me. 486, 90 Atl. 318, 51 L. R. A. (NS) 1143 the Maine Court held that a city could operate a municipal coal yard, saying in part in the opinion:

"Let us look at the question from the practical and concrete standpoint. Can it make any real and vital difference and convert a public into a private use, if instead of burning the fuel at the power house to produce the electricity, or at the central heating plant to produce the heat, and then conducting it in the one case by wires and in the other by pipes to the user's home, the coal itself is hauled over the same highway to the same point of distribution? We fail to see it. It is only a different and a simpler mode of distribution, and, if the legislature had the power to authorize municipalities to furnish heat to their inhabitants, 'it can do this by any appropriate means which it may think expedient.' The vital and essential element is the character of the service rendered, and not the means by which it is rendered.

"But it is urged: Why, if a city can establish a municipal fuel yard, can it not enter into any kind of commercial business, and carry on a grocery store, or a meat market, or a bakery? The answer has been already indicated. Such kinds of business do not measure up to either of the accepted tests. When we speak of fuel we are dealing, not with ordinary articles of merchandise, for which there may be many substitutes, but with an indispensable necessity of life; and, more than this, the commodities mentioned are admittedly under present economic conditions, regulated by competition, in the ordinary channels of private business enterprise. The principle that municipalities can neither invade private liberty nor encroach upon the field of private enterprise should be strictly maintained, as it is one of the main foundations of our prosperity and success. If the case at bar clearly violated that principle, it would be our duty to pronounce the act unconstitutional, but, in our opinion, it does not. The element of commercial enterprise is entirely lacking."

In Jones vs. City of Portland, 113 Me. 123, 93 Atl. 41, the Maine Court again upheld the validity of the municipal coal yard act. In Jones vs. City of Portland, 245 U. S. 217, 38 Sup. Ct. Rep. 112 the United States Supreme Court affirmed the Maine Court saying:

"The authority to furnish light and water by means of municipally owned plants has long been sanctioned as the accomplishment of a public purpose justifying taxation with a view to making provision for their establishment and operation. The right of a municipality to promote the health, comfort, and convenience of its inhabitants by the establishment of a plant for the distribution of natural gas for heating purposes was sustained, and we think properly so, in State of Ohio vs. Toledo, 48 Ohio. St. 112, 26 N. E. 1061, 11. L. R. A. 729. We see no reason why the State may not, if it sees fit to do so, authorize a municipality to furnish heat by

such means as are necessary and such systems as are proper for its distribution. Heat is as indispensable to the health and comfort of the people as is light and water."

In Stevenson vs. Port of Portland, decided in 1917, 162 Pacific 509 the right of the city of Portland to sell coal to ships was involved and the Oregon Court held that the sale of coal by a city was a public purpose saying:

"Custom and usage may be important factors in determining whether a tax is for a public or private purpose; but, while recognizing the influence of customs and usages already established, the courts are mindful of the fact that new customs may be formed and new usages may prevail, and that conditions may change as time advances, so that a purpose which was concededly private a decade ago may now be public and so, too, those which today are admittedly private purposes, tomorrow may be public in their nature."

In the cases of Green vs. Frazier, 176 N. W. 11, (North Dakota), Green vs. Frazier, 253 U. S. 233, Scott vs. Frazier, 258 Fed. 669, all involving the right of the State of North Dakota to build and operate state elevators and flour mills, the decisions permitting cities to operate municipal coal yards were cited with approval and in principle followed.

In Scott vs. Frazier, 258 Fed. 669 on page 675 of the opinion the court said:

"McQuillin on Corporations, Section 1809, and the fifth edition of Dillon on Municipal Corporations, Volume 3, Section 1292, which contain the last word of textwriters on the subject, solemnly inform us that cities cannot be authorized to establish publicly owned coal and wood yards, because that would be using the taxing power for a private purpose. The next edition of these works will strike out this language and inform us that such yards are permissible, because they are for a public purpose and are publicly owned, citing Jones vs. Portland, 245 U. S. 217, 39 Sup. Ct. 112, 62 L. Ed. 252, L. R. A. 1918C, 765, Ann. Cas. 1918E, 600. Thus 'can' succeeds 'can't' in this field of law so rapidly that one can hardly tell which word he is looking at."

In Wheelon vs. Settlement Board, 181 N. W. 358 and State Reclamation Board vs. Clausen, 188 Pac. 538 (Washington) involving the right of states to engage in reclamation and land settlement projects the city coal yard cases where cited with approval and their principle followed.

The basis of the opinion of the Massachusetts Court that a city can not engage in the fuel business is the case of Lowell vs. Boston, 111 Mass. 454, which is the leading authority in this country declaring a statute unconstitutional because it authorized taxation for private purpose.

In 1917 by a popular vote of 261,138 to 52,437 a constitutional amendment was adopted sweeping away this decision. With reference to this Judge Amidon in his decision in the North Dakota elevator case, 258 Fed. 699 on page 677 of the opinion says:

"This was the first time that the reasoning of Lowell vs. Boston was brought to the judgment bar of the people of the State. That decision had stood for more than half a century as an authority supporting scores of decisions nullifying laws to correct evils from which men, women and children were suffering and furnishing reasons to even more congresses, legislatures, and city councils why other laws should not be passed to correct such evils. And now that the real supreme tribunal of Massachusetts, the people of that commonwealth, has swept all these judicial precedents away in that State, what do we say has happened? This:

"The court was right all the time; but the people have now amended their constitution and granted the legislature power to do what the court said they could not do before, and so the legislature may hereafter enact needed laws."

"But does that state the whole truth? I think no. Is it not more true to say that the people of Massachusetts have corrected, if not rebuked, the judges of their Supreme Judicial Court? Have they not really said to their judges:

"You have been wrong all this half century. We never intended those general words in the Constitution to mean what you have been saying they mean, and we wish you would not use them any more to protect practices that have been proven to be economically, morally, and legally unsound. (Ives vs. South Buffalo Railway Co., 201 N. Y. 271-287, 94 N. E. 431, 34 L. R. A. (N. S.) 162, Ann. Cas. 1912B, 156), and nullify laws passed for their correction."

"Is not that the real interpretation of what has happened, not only in Massachusetts, but in the adoption in nearly every State in the Union, during the last 15 years, of constitutional amendments to correct decisions made under the general provisions which forbid a deprivation of life, liberty, and property without due process of law?"

In American Coal Mining Company vs. Coal Commission, 268 Fed. 562, decided by three Federal Judges, an Indian statute authorizing the State to regulate and fix coal prices was held constitutional.

In People vs. Keyes, 201 Pac. 54 coal mining was held to be an industry affected with a public interest.

In the case of Central Lumber Company vs. City of Waseca, decided by the Minnesota Supreme Court, May 19, 1922, 188 N. W. 279 that court held:

"The establishment of a municipal coal and wood yard is a public purpose; and the home rule charter of Waseca, authorizing it, does not violate the State constitution providing that taxes shall be levied and collected for public purposes, nor the Fourteenth Amendment."

In the opinion the court said:

"Economical and industrial conditions are not stable. Times change. Many municipal activities, the propriety of which is not now questioned, were at one time thought, and rightly enough so, of a private character. The constitutional provision that taxes can be levied only for public purposes remains; but conditions which go to make a purpose public change."

The distinction, sometimes attempted to be drawn, between municipal water works, light plants, and heating plants, and a municipal fuel yard, that the former are legal because a special privilege or franchise to use the highways is required for their operation, while the latter, not requiring such special franchise is illegal, is not without support in the authorities, because it is well settled now that a business may be affected with a "Public Interest" in cases where no special privilege or franchise is conferred by the public or required for its operation. State vs. Rogers, 182 N. W. 1005. German Alliance Ins. Co. vs. Lewis 233 U. S. 389.

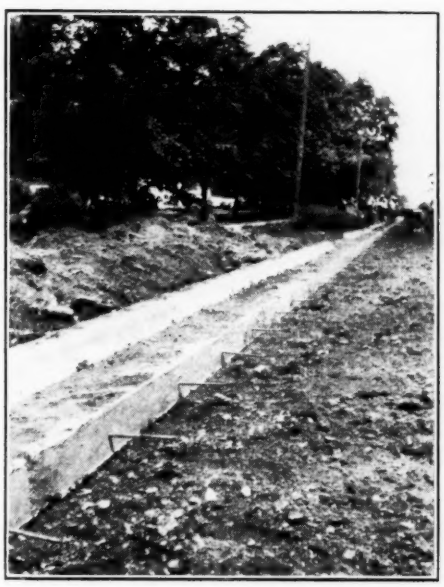
Summarizing the authorities we find opposed to the right of the city to engage in the coal business two advisory opinions, one of them and the earliest one, which formed the basis of the subsequent one, by a divided court. These opinions have been overruled by the people in their constitutional conventions. In addition to these advisory opinions there is one decided case which is not now followed by the court which decided it. Opposed to these are the decisions of the United States Supreme Court and the Supreme Courts of Maine, Oregon and Minnesota, which during the last five years have passed directly upon the question and upheld the right of a city to engage in the coal business. The decisions of these courts have been cited and followed with approval by the courts of South Dakota and Washington and by the other Federal courts.

I think it may be fairly claimed that under the weight of judicial authority in this country the sale of fuel at retail is within the power of municipalities and the establishment of a municipal coal and wood yard is a public purpose.

STEEL BARS TIE COMBINED CURB AND GUTTER TO PAVEMENT AT LIBERTYVILLE, ILL.

By Charles E. De Leuw, of Kelker, De Leuw & Co., Engineers, Conway Bldg., Chicago, Ill.

A reinforced concrete pavement is being constructed on Milwaukee Avenue through the village of Libertyville, Ill.,



COMBINED CONCRETE CURB AND GUTTER OF UNUSUAL DESIGN AT LIBERTYVILLE, ILL. NOTE DENSITY OF CONCRETE AT FACE OF GUTTER AND STEEL TIE RODS TO JOIN GUTTER AND PAVEMENT.

which involves some departures from stereotyped designs of such work. The principal feature of interest is the concrete combined curb and gutter; the curb and gutter is being constructed without a mortar finish coat and is tied into the pavement by means of steel tie bars.

Combined Curb and Gutter

For a number of years it has been cus-

tomary to construct the curb integral with the pavement on concrete pavements. This has resulted in some economy and has also strengthened the structure at the edges, due to the increased depth and strength of the beam at each side of the pavement. On the other hand, it has been difficult to secure true line and pleasing finish on integral curb. The gutter has frequently been left with small pockets which hold water and the face of the curb lacks even and true alignment.

The Libertyville curb and gutter was designed so as to permit of its construction in advance of the pavement, following the customary construction of brick, asphalt and block pavements. It is shown in the accompanying view. The ½-in. round bars are spaced on 3-ft. centers and they project 9 ins. into the gutter, as well as the pavement. Holes were drilled through the steel forms to accommodate these tie bars, and no particular difficulty was experienced in removing the forms.

The concrete was of the consistency required by the Illinois Highway Department for concrete pavements. The proportions were also the same as the concrete for pavement (1-2-3½) and no mortar finishing coat was used. The face board was removed about 30 minutes after the placing of concrete and the face and top surface of the curb and gutter given a brush finish. The corners were rounded to a ¼-in. radius with an edging tool. The resulting surface, while not as smooth as can be obtained by using a mortar finish, was quite satisfactory.

Advantages

The principal appeal to the experienced engineer is the substantial nature of this construction. The use of a rich mixture insures a dense, sound concrete of high strength. The elimination of the mortar coat results in one solid structure with the same coefficient of expansion throughout. Improper handling or inadequate mixing is readily apparent and it will be possible no longer for the contractor to cover a lean mixture of poorly mixed material with a rich mortar top.

The use of tie bars makes the curb and gutter to all intents and purposes an integral part of the pavement, thus securing the advantages of the integral curb construction with none of its disadvantages of finish and workmanship. The curb and gutter will move laterally and vertically with the pavement, and there will be no displaced curb and gutter after a few years' time as a result of frost action.

Detailed cost records on this construction are being kept so that an exact comparison can readily be made between the cost of this curb and gutter and the two-course type. The following is a typical daily cost report on curb and gutter:

DAILY REPORT OF INSPECTOR

June 22, 1923 Job. No. 239

Class	No.	Hrs.	Rate	Tl. Pay
Form Setter	1	10	$0.90	$ 9.00
Form Setter Helper	2	20	0.60	12.00
Engineer	1	10	0.90	9.00
Finishers	3	30	0.60	18.00
Foreman	1	10	1.00	10.00
Laborers—Oiler	1			
Wheelers	6			
Tampers	4			
General	5			
		160	0.60	96.00

Total Labor Cost.....$154.00
Cement, total, 39 barrels.
Per lineal foot, .090 barrels.
Progress—434.5 lineal feet of curb and gutter; labor cost per lineal foot, $0.355.

It is apparent that the cost of this structure is about equal to the cost of the familiar two-course curb and gutter. The labor cost on the entire job averaged 35.7 cts. per lineal foot of curb and gutter.

James Cape & Sons of Racine are the contractors on the work, which is being constructed under the supervision of L. H. Cather, resident engineer for Kelker, DeLeuw & Company of Chicago.

IODINE TREATMENT OF A PUBLIC WATER SUPPLY FOR PREVENTION OF GOITRE

By Beekman C. Little, Superintendent of Water Works, Rochester, N. Y.

(Editor's Note: This very important article was presented as a paper before the recent annual meeting (May, 1923,) of the American Water Works Association, of which Mr. Little is a past president. Those interested in other articles on the iodine treatment of goitre are referred to the bibliography in the Journal of the American Water Works Association for July, 1923).

The statements to be made concerning the particular malady discussed in this paper have been gleaned from the writings and opinions of others than myself, for I know little about the cause or treatment of goitre.

The Water Bureau and the Health Bureau of Rochester, working together, believe they have evolved a plan for successfully treating and preventing goitre. With great emphasis on the latter: for *prevention* is the ideal we seek.

Having great faith in the idea, I desire to launch it here at this convention and to have the American Water Works As-

sociation broadcast it to the world. It is earnestly hoped, therefore, that you will bring the matter before the health officers and medical associations of your respective communities.

Simple goitre is a disease which has probably come to the attention many times of every one here. It is generally recognized as a swelling of the neck due to the enlargement of the thyroid gland. The extent to which goitre prevails is seldom appreciated. In the entire world there are few countries free from goitre districts and sporadic cases of goitre exist in every section and nationality in the world.

In North America, goitre is endemic, especially and continually prevalent in the whole of the Great Lakes region and in the basin of the St. Lawrence and in the northwest Pacific region.

The seriousness of the disease itself may be learned with little investigation. There is a relation betwen goitre and cretinism or idiocy, marked by physical deformity and degeneracy.

Statistics are not always reliable, but it is safe to say that in this region along the Great Lakes, in Detroit or in Rochester, 7 out of every 100 school children are afflicted with goitre. In addition, a large proportion of all the women who consult physicians have the disease.

Certainly this is a disturbing condition and any promising suggestion for its alleviation should receive at least attention.

Iodine is a natural constituent of the normal thyroid gland. It is essential to normal thyroid activity. The amount of iodine required is exceedingly small, but, when this amount is absent, the thyroid gland seeks by increase in size and surface to make up for this lack in iodine, and goitre is the result. In fact, goitre has been described as an adaptation to "iodine-deficient" nutrition. It follows, therefore, that the treatment for goitre, now pretty generally practiced, is the giving of very small dosages of iodine. The small amount of iodine now considered necessary is indicated by the fact that 1/10000 of a gram of iodine taken daily over a period of 15 or 20 days is an accredited prescription. This dose is given twice a year, once in the spring and again in the fall.

A recent study from the laboratory of the University of Minnesota, by Dr. J. F. McClendon, shows clearly the inverse ratio between the amount of iodine in surface water and the distribution of goitre. In the neighborhood of the sea, the air and water contain much more iodine than in inland places, and these places distant from the sea have high goitre incidence.

What we propose to do is to introduce into our drinking water a very minute quantity of iodine and thus bring to the human system and the thyroid gland that which it needs, and otherwise lacks, to function properly.

This idea of dosing every one willy-nilly is startling but not unknown, so that it is not altogether revolutionary. For instance, in Switzerland, where goitre is prevalent, it was decided last February, in one canton, to incorporate a small amount of iodine in all the table salt used. All civilized persons take daily a certain quantity of salt and, as it is inexpensive and the Swiss government can control this article of food, it seemed to be the proper carrier for the iodine.

This way of doing it, even if it were possible in this country, does not seem to have the advantages of the water supply method.

In the recommendation of our plan in Rochester, Dr. Goler, the Health Officer, states:

1. We always have in Rochester, among our children, more than 2,000 cases of preventable goitre.

2. We have so much simple goitre because of the absence of minute quantities of iodine in our food and drink.

3. We may prevent this goitre by the addition of minute quantities of iodine to the drinking water in the amount of 2/10,000 of a gram to a gallon, in the form of iodide of soda.

4. Iodine seems to be required by the body. When taken into the body in these minute quantities, it is fixed by the thyroid gland and its enlargement, and consequent goitre, is prevented.

5. If we put iodine in the water, it will be necessary to dose the water only twice a year, for two weeks. This would require each day 13.3 pounds of iodide of soda for two weeks, or 372 pounds at $4.80 per pound, or $1,785.00 a year.

6. To prevent goitre would cost less than $2,000.00 a year. The addition of this minute quantity of iodine would also affect favorably young persons already having goitres. It would not affect that form of goitre known as "Graves Disease" or exophthalmic goitre. It would not affect older goitres.

The Water Bureau at Rochester has already started this treatment of the water. At one of our reservoirs, from which is

drawn all of the water entering the city mains, we have dissolved daily—for a period of two weeks—16 lbs. of iodide of soda, a slightly greater amount than first suggested.

Our consumption of water during this period was approximately 25 million gallons per day. In the laboratory of the Health Bureau, and checked up by chemists in the University of Rochester laboratory, accurate check was kept and it was found that the iodine content in the water increased from 1 part in a billion parts of water, before the experiment, to 20 parts in a billion after the addition.

Next fall the dose will probably be increased, as it is planned to get about 50 parts of iodine to one billion parts of water.

It is calculated that such a water, prevailing for two or three weeks, twice a year, will give to those drinking of it freely approximately the amount of iodine needed to bring to a close the story of simple goitre in Rochester.

DELAY IN AWARDING CONTRACTS COSTLY TO CONTRACTORS

By William Russell Davis, Consulting Engineer, 90 State St., Albany, N. Y.

The hazards of contracting are many. This article treats of some actual experiences the author had in connection with the award of contracts. The names of the parties are best omitted.

About ten years ago the writer, acting for contracting clients, prepared a contract proposal for a bridge over a stream dividing two counties in one of the United States of America. The advertisement requesting proposals appeared in the Engineering News, and asked for a lump-sum price. Preparation of the proposal involved a careful estimate of the quantities involved, a study of local conditions including costs of local labor and materials, the collection of quotations for steel cylinders for piers and for steel superstructure, etc. Altogether the cost of preparing an intelligent proposal was quite considerable.

At the time the material market was constantly advancing and quotations were subject to revision in from four to six weeks.

The specifications fixed the number of days for completion with a daily penalty for non-completion within the time limit. The bids were received in May and the author planned for completion before the cold weather of the following winter.

The bid submitted by the author was approximately $80,000. It was low by about $4,000 and contract was awarded promptly by the county where the bids were received but SUBJECT to award by the adjoining county. We were then informed that the officials of that county would not meet until four weeks later. The author was present at the later meeting, when the contract was awarded "subject to the sale of bonds." It was then explained that the financial arrangements would be completed and the contract executed in a few days. However, the matter was repeatedly postponed and about three months had elapsed before the authorities were ready to execute the contract.

During the interval we frequently advised that our work would be thrown into the winter, thus increasing our costs, and that the advances in the material market would have a like effect. When the authorities were ready to sign we submitted original data and our estimates to show that we were entitled to an additional $10,000 on account of the delays. We refused to sign at the original price and requested an adjustment. The authorities insisted that we were obligated to stand precisely by our original proposal and cashed our certified check for $5,000. They readvertised the contract and awarded it for approximately $93,000 as against our revised offer of $90,000.

We applied to the courts and our $5,000 was returned. We were allowed certain expenses, but our lawyers' fees and some other large costs were not allowed. Altogether we were out several thousand dollars in connection with this contract.

In a large city of another State, although the author found no indication of anything amiss, he also had an experience of delay in award in the face of a rising market on account of non-completion of financial arrangements. The contract amounted to over $1,000,000 and the certified check for $20,000 was held and cashed. Again it was necessary to appeal to the courts. Again the court ordered the return of the deposit and again there were some large expenses for which we were not reimbursed.

One more instance is the case of the Department of Public Works of a large State. The proposal of the author was not involved but he was perfectly familiar with all details. The financial ar-

rangements had not been completed and there were several months' delay with a rising market. The contractor refused to execute the contract and his check was held for many months thereafter, although it was ultimately returned without recourse to the courts.

It is of interest to cite an experience of the author in dealing with the authorities of a large city to which he furnished professional services of an expert nature, giving sworn testimony before a legal investigating committee. The administration delayed payment to the end of its term; a necessary ordinance was vetoed by the Mayor on his last day; the new administration was of the other party and was not much interested. It was about two and one-half years after the services were rendered that payment was made without interest. Lawyers, engineers, accountants, etc., were all affected by the delay.

These experiences are or should be of much interest to government authorities, engineers and contractors. Perhaps the authorities do not realize the effect of such delays on the interests of the contractor. They should clearly understand that such delays mean substantial losses and expensive law suits for which, eventually, the public must pay. Before invitations for proposals are issued, all arrangements should always be completed to the point where an award can be made within ten days or two weeks. The engineer who prepares the contract plans and specifications should also keep these matters in mind and use his influence with the authorities to correct the evils herein described.

It is clearly to the interest of the contractor to inquire of the authorities by letter as to whether or not financial arrangements have been completed and whether or not an award may be confidently expected within two weeks after receipt of the proposals. In lieu of a favorable response, he should either refrain from bidding or should attach to his proposal the condition that the proposal will not hold unless the award is made and the contract signed within a specified time. It must be borne in mind that the execution of the contract is the vital issue, as no contractor is safe in proceeding with his work before execution. Even in face of the usual conditions set forth in invitations for proposals, it is not likely that the authorities will reject an advantageous bid with such a condition attached if necessary arrangements have been completed. Should the bid be rejected for such cause, so much the better for the contractor.

THE PRESENT CONDITION OF PRIVATE WATER COMPANIES

By Waldo S. Coulter, Consulting Engineer, 11½ Liberty St., New York, N. Y.

In the more important states, private water companies are within the jurisdiction of state regulatory commissions having extremely broad powers. These powers embody rate-making functions and extend even to the abrogation of long-established contracts which a commission may deem inequitable.

In securing increased rates from such a commission, the time element is an important feature. A water company finding itself, for some legitimate reason, unable to secure an adequate return from established rates, must prepare necessary exhibits, apply to a commission for relief, await hearings, present its case at such hearings and await results. Finally, the date on which the new rates go into effect may be many months after the initiation of the matter. Since the decisions of such commissions are subject to judicial review, some consumer may take the matter to the courts. A Supreme Court case may be followed by an appealed case.

The point is that for one reason or another, there is too often a lag of the net return, a fact of which private companies are painfully aware. Can this lag be overcome?

The Sufficiency of Rates

Let us consider the sufficiency of rates. A commission establishes certain rates on the assumption that they will yield a certain percentage rate of net return on the investment. After the rates go into effect, it turns out that they are in practice insufficient to yield the assumed percentage rate of net return. The company experiences a deficit, not perhaps a negative return, or even a deficit below the line of actual confiscation, but nevertheless a deficit in the sense of failing to earn the return which the commission assumed when fixing the rates and which it deemed necessary to encourage the investment of private capital in a public water utility.

The same result may attend increases of the deficient rates, particularly during

a period of rising costs, and this condition may extend over a period of several years. The question arises, can deficiencies below the assumed percentage of net return, during time past, under regulation, be collected by the company? Is a commission, having assumed a certain percentage rate of net return when establishing rates, bound to see to it that the rates actually produce such a percentage of return? We are, of course, assuming that failure to secure the return is not due to mismanagement on the part of the company, but is altogether owing to the rates. A certain State Supreme Court has decided that the company must be reimbursed for deficiencies of this character, and has instructed the state commission to increase rates accordingly. As an appeal has been made from this decision and the case is now pending, I will not attempt to discuss the matter further.

It may be of interest, however, to consider how such deficiencies might be collected. First, they might be capitalized and added to the rate base. The equity of such a procedure is highly questionable, however, and the scheme may be dismissed from further consideration. Second, the rates may be increased, during a given period, sufficiently to make good the deficiency. The amount of the rate increase to secure a given return would, of course, be fixed by the length of the period during which the deficiency was to be made up.

Rate bases are today largely affected by pre-war construction costs. The majority of water plants date from some time before the war and were mostly constructed when prices were much lower than they now are.

Using Present-Day Costs

As to the use of present-day values in arriving at a rate base, most regulatory commissions and engineers are of the opinion that fair value for rate-making purposes should be based on an average that will represent fairly both pre-war and subsequent construction costs. It is true that certain decisions of the Federal Supreme Court, and of state courts, are interpreted by some to mean that undiluted present-day costs are to be used in valuations for rate-making purposes. Today, the practical effect of such a policy would be legalized stock watering. During periods of abnormally high prices the company would win. Present high construction costs may and probably will be followed by lower costs. Water companies are now undertaking extensive betterments at very high costs. Should a policy of using present costs in rate-making valuations, to the exclusion of all others, be permanently adopted, water companies will face a heavy loss on these betterments, should construction costs fall. A fair policy is always better in the long run for everybody.

As capital extensions and replacements are undertaken at present high costs, the weight of pre-war costs, as regards the total investment, tends to diminish. This means that increasingly higher rates will be necessary to care for this condition while present high costs exist.

The Lag of Net Return

Here again the water company must be prepared to encounter the depressing losses brought about by the lag of net return. That is, losses from the percentage rate of net return which good public policy should grant to encourage private ownership and operation of public utilities.

The future outlook is one of continuous struggle to increase rates from time to time to meet the gradually increasing investment value caused by the gradual replacement of pre-war construction at high cost and the abnormal cost of capital extensions.

This, in turn, brings up the difficulty of financing betterments and extensions, which every growing water company is facing today. In many cases it would seem that only some co-operative arrangement would permit companies to undertake new construction. Possibly this could be arranged by securing contributions from water users, with the understanding that they will be granted a stipulated reduction in rates in lieu of interest. The restricted limits of this brief article prevent a consideration of this question, which deserves an article itself.

For State Regulation Regardless of Ownership

A word may be added, however, as to the effect of the rates charged by municipally-owned and operated water plants. Most such plants are adhering quite closely to pre-war or near-pre-war rates. This is because of the well-known failure of many city departments to provide an adequate gross income. The relatively small profit increment received by privately-owned utilities is insufficient to account for the difference. The public invariably compares the rates of munici-

pally-owned plants with those charged by private companies, to the disparagement of the latter.

As a matter of fairness, it seems but reasonable to insist that municipally-owned water works systems should be under the control of state regulatory commissions and subject to the requirements now imposed on private companies.

POINTS OBSERVED IN EXAMINING A MILLION SQUARE YARDS OF CITY PAVEMENTS

By Paul E. Green, Consulting Engineer, 400 N. Michigan Ave., Chicago, Ill.

An examination of approximately a million square yards of pavement of various types laid in 1922 in the city of Chicago, and of a large yardage of earlier construction was made by the writer this spring. A vast amount of valuable information was obtained as to merits and defects of various types of construction. Much of it applies, particularly, to local conditions in Chicago and would be of no interest to readers of this magazine, but some of it is general in character and some of these conclusions are as follows:

Brick Paving

The city of Chicago has laid brick pavements for many years and the material entering into the construction has been carefully tested and the specifications are modern and up-to-date. Inspectors have always been placed on the work during construction and the City's engineers have modified the specifications from time to time as conditions would warrant. Most of the filler used in brick pavement is of tar or asphalt. Many of the alleys, particularly, have used cement grout filler.

Particularly in pavements using a tar filler it is evident that within a short time after the work has been completed, certainly as cold weather approaches, the filler begins to chip out of the joints. The result is that in a year or two there is no filler for a distance of one-quarter to one-half inch below the surface. The edges of the brick are then battered down and the more they are battered, the harder it is on the pavement, as the impact from heavy loads frequently breaks through the foundation. Asphalt filler is more successful in that it does not chip in winter or soften up so freely in summer, but in the course of a few years somewhat of the same effect is apparent. However, it is believed that asphalt filler is superior to tar filler.

In alley pavements where a large amount of cement grout filler has been used, the effect of expansion is very apparent. Many of the alleys are badly cracked and the edges of the brick spalled. The surface, however, is fairly smooth, but spotted with patches of disintegrating blocks.

Concrete

A considerable mileage of concrete pavement has been laid in alleys and a few in streets. In general, these concrete pavements are in good condition, though cracked. Expansion is evident in many places and frequently inadequate provision has been made to take care of this feature. It would seem as if the experience of engineers with brick paving using cement grout filler would have been a lesson in the construction of concrete pavements, but many engineers are still laying concrete pavements, providing for contraction joints, but not providing for expansion joints. The result has been during the past summer that there have been a great many examples of "explosions" in concrete surfaces. The conclusion reached is that provision must be made for both expansion and contraction in the construction of concrete pavements and unless such provision is made, trouble will inevitably follow.

While only 1922 construction was officially examined and reported on, still many thousands of yards of earlier work was observed. It was found that frequently a depression over the connection between the sewer storm water inlet in the gutters and the sewer itself was evident. Rarely was a depression found over the main sewer. In the construction of pavements there are usually many more inlets installed than were placed on the original sewer. The sewer itself may have been built several years prior to the laying of the pavement. Many of these depressions do not show up during the first year, but become increasingly evident as years pass. The lesson to be learned is that greater care is essential in making sewer connections and that many of our rough pavements are rough because of lack of care at the time the inlets were installed.

Concrete Curb

Thousands of feet of concrete curb were examined. Most of the curb consisted of cement limestone concrete. The older curb was of cement granite

concrete. It is believed, as a result of this examination, that the granite concrete is decidedly superior for curb purposes to limestone. It wears better and withstands the grind of traffic.

It was also observed that corners having a small radius, as for instance 2 or 3 feet, were much more affected by expansion in the concrete than were corners having a larger radius, say 6 to 10 ft. This was irrespective of the effects of the traffic turning the corner. Nearly all curb more than a year old, having a small radius, had the corner stone badly distorted or broken. Practically none of the curb corners having a larger radius showed signs of disintegration of this sort.

Bituminous Surface

The traffic on the main boulevards in Chicago is exceedingly heavy, in some cases amounting to more than 30,000 vehicles per day. Nearly all the boulevards are surfaced with mixtures of either sheet asphalt, or asphaltic concrete. A few have bitulithic. During warm weather the asphaltic concrete, in particular, softens up and the oil becomes very apparent on the surface. It is necessary to spread over these surfaces gravel or granite chips in order to keep the roadway serviceable. Much of the asphaltic concrete pushes into waves under intense traffic and these waves are very difficult indeed to eradicate. In the usual course of maintenance an asphalt seal course is spread over the surface and chips rolled in. Under heavy traffic this does very well for awhile, but by the following season much of this surface treatment has been worn away and only patches remain. These patches are very rough.

This condition is not nearly so apparent on the standard sheet asphalt surfaces or on the bitulithic. The mixtures appear to be more stable than asphaltic concrete. It is to be expected as the ingredients are more carefully graded.

The lesson to be learned in this examination was that great care must be taken in grading the mineral aggregates of bituminous pavements, just as great care as is necessary in the preparation of the asphaltic material.

Foundation Troubles

A good many cases were found in which the foundation was apparently shattered. This by no means was the result of too thin a foundation; more generally it seemed to be caused by variation in the wearing surface; in other words the wearing surface was more or less wavey and traffic dropping into the low spots caused very heavy impact stresses to be set up in the foundation, which in time on heavy traffic streets, with the trucks keeping close to one line of traffic, caused failure of the foundation. This result may be obviated to a great extent by more careful rolling and grading of the surface. It is largely a matter of workmanship.

MAINTENANCE AND REPAIR OF CITY PAVEMENTS

By Willis D. P. Warren, Consulting Engineer, Millikin Bldg., Decatur, Ill.

Considering the fact that we now have a character and volume of traffic entirely different from that of a few years ago, and considering the further fact that municipalities today are finding the expense of various public improvements more difficult to meet, it is believed that the attention of the engineering profession and of interested officials and property owners should be directed to the economy which is possible where city pavements are properly maintained and repaired.

When it is recalled that our State Highway Departments consider maintenance as of first importance, and further, that state maintenance begins shortly after construction, and continues without interruption thereafter until such time as it is found proper to entirely resurface or rebuild, it is difficult to understand just why municipal officials have been so slow in comprehending the tremendous loss involved in the neglect of their pavements.

Typical Example of Neglect

As a typical example of the situation which exists in many cities, it might prove of interest to refer to Decatur, Illinois, which is generally considered and is, as a matter of fact, a live and progressive community. As we have here an investment of approximately $5,000,000 in pavements, and as our population is approximately 50,000, it may be seen by a little computation that the investment in city pavements throughout the country is one of substantial magnitude. The situation in Decatur is simply that where the Street Department has an appropriation of from fifteen to twenty thousand dollars a year for the maintenance and repair of old pavements, it should have an appropriation of prob-

ably $100,000 or more, per year, especially so, since we have what might be termed "deferred maintenance," inasmuch as our pavements have received little, if any, maintenance since their first construction.

The plea has been made here as elsewhere that the City has no funds with which to make ordinary repairs, whereas under certain legal proceedings they can entirely rebuild a pavement or resurface it, assessing the cost against the property especially benefited; therefore, repair and maintenance are practically unknown. The points which it is desired to emphasize in this article, are as follows:

Maintenance and Repair Fundamentals

(1) Repair should begin on city pavements immediately after their construction, and continue thereafter under proper supervision and direction, until such time as resurfacing or renewal are found to be more economical.

(2) Where there exists a considerable yardage of old pavements, or where pavements have been in service a number of years, exhaustive surveys, studies, investigations and reports should be made concerning the condition of such pavements, and recommendations made as to the proper methods of their repair, maintenance or reconstruction.

(3) No pavement should be entirely resurfaced, unless a careful survey and estimate has been made to show that such resurfacing is more economical than repair. The complete resurfacing of pavements is frequently as great a waste as is the failure to provide ordinary repairs.

(4) No pavement should be entirely removed and a new pavement constructed, unless careful surveys, studies and investigations showing that such construction, considered over a period of years, will be more economical than resurfacing.

(5) Municipal thrift should be encouraged by pointing out to property owners and officials, feasible methods of financing such maintenance and repair.

The conditions at Decatur are not at all unusual, and are not due to special neglect on the part of any particular official or officials, but more to the fact that property owners have not been properly informed regarding the tremendous waste involved in permitting pavements to be thus neglected.

Proper Maintenance

It is true, no doubt, that pavements on state highways, ordinarily have less traffic and less abuse than pavements on city streets, and inasmuch as it is considered sound business by the people of the state to finance highway pavement maintenance and repair, it is certainly much more essential that city pavements should be given the same consideration.

In order that city pavements may have proper maintenance, and that property owners may feel disposed to vote necessary funds for such work, it is believed that, in general, all maintenance and repair work should be done under the direction of the engineering department for the city.

The point really to be considered is that we can no better afford to neglect the repair and maintenance of our city pavements, than the state can neglect the repair of its highways. With this fundamental proposition in mind, it should be endeavored by every possible means to secure necessary funds with which to finance proper repairs.

Surveys and Investigations

It is really surprising, when we consider the thought and care with which engineers and architects develop designs for improvements costing one hundred thousand dollars, more or less, and yet at the same time, with less than an hour's investigation or study, engineers frequently decide that a pavement should be entirely resurfaced, or that it should be entirely removed, and a new pavement constructed in its place.

In this connection it should be remembered that the repair of each type of pavement presents a special problem, and that pavements under different traffic conditions, present different problems. Any pavement which has carried traffic over a period of years, has undoubtedly reached a firm and substantial foundation and is in condition to support and distribute the weight of traffic probably as well, if not better, than a new pavement, provided the irregularities in the surface be once removed.

From our knowledge of old brick pavements, we believe that a large per cent of such pavements might be placed in proper condition by relaying a portion of the surface with new brick, or where in a more serious condition, by taking up the present brick wearing surface, laying a sand Tarvia or other proper cushion, turning the brick and relaying them to a true surface, adding such new brick as is necessary. Upon close study

and investigation it will frequently be found that where a street may sometimes appear to be almost impossible of repair or maintenance, due to the settlement of a portion of the pavement over old excavations, or due to the unusual wear which has occurred on portions of the surface, that probably not over five to ten per cent of the surface is in bad repair.

Also our concrete, wood block, asphalt and other pavements, present their special problems; however, it is believed that the life of such pavements can be greatly prolonged, provided they receive proper attention.

An important point to be borne in mind is that sooner or later the property on any particular street will either be assessed for a new improvement or for the maintenance and repair of the present improvement, and when it is considered that the life of many pavements can be more than doubled by proper and timely repair, the value of such work can be more thoroughly appreciated. In the judgment of the writer the property owners of the City of Decatur, will sacrifice several hundred thousand dollars in the next few years unless funds are raised for proper pavement maintenance and repair, and such work undertaken immediately under the direction of the engineering department for the City.

Financing

In suggesting the value of such maintenance and repair, it will not be amiss to point out methods whereby funds may be derived to carry out this work. Inasmuch as there are several sources from which finances may be secured, it is thought desirable to indicate a few of those which come to mind at this time.

(1) General Municipal Funds. From the general municipal funds most cities set aside a certain amount for street pavement, repair and maintenance, the amount, however, thus set aside being generally sufficient to take care of only a small portion of the work to be done. Considering the case of our own City, where approximately $800,000 is appropriated annually for general municipal purposes, it will be interesting to note that the amount appropriated for street maintenance and repair is very little over 2% of this total, and this in a city where we have approximately 5,000,000 invested in pavements which have had no substantial maintenance or repair since their first construction.

(2) Wheel Tax or Vehicle Tax. In many cities a Wheel Tax may be voted, the funds to be derived therefrom to be used for the purpose of street maintenance and repair. Such a tax is undoubtedly fair for the simple reason that the man who uses the vehicle, and who desires a good pavement, is required to assist in financing its maintenance.

(3) New Legislation. Considering the volume of maintenance and repair work to be done in many of our cities, in view of the past neglect of pavements, it might be well to enact legislation which would enable cities to raise funds with which to organize and finance proper pavement maintenance and repair.

(4) Co-operation. It has been the experience of the writer that where a public official, authorized to care for certain pavements, fully appreciates his responsibilities, and where he has the vision to see the need for repair work, he can frequently finance the same by organizing interested property owners, and by securing their co-operation in raising necessary funds.

The vital fact to be kept in mind in undertaking the financing of pavement maintenance and repair is the economy of such work, as compared to the great expense for resurfacing or rebuilding. As a matter of fact, funds properly invested in maintenance and repair work will return dividends far in excess of funds which might be invested in any form of new construction.

Conclusion

In conclusion, it is desired to emphasize the fact that we now have hundreds of millions of dollars invested in city pavements, which have reached an age where they must be repaired, maintained, resurfaced or entirely renewed. Also it is desired to emphasize the fact that we have new traffic conditions, making it far more essential to do such maintenance and repair work than it was under the conditions of traffic five or ten years ago.

Comparatively few people appreciate the fact that over 95% of all concrete pavements have been constructed during the past 10 years, and probably still fewer realize that most brick pavements have been constructed during the past 20 years. With this knowledge it will be more readily understood that we have reached a period wherein greater consideration must be given to the scientific study, investigation and design of pavement repairs, maintenance and renewals.

When we consider the vast amount of

data which has been collected during the past few years relative to the strength of pavement slabs, impact forces, and the proper design of pavements of various types, it may be seen that unusual opportunities are offered for the application of this new knowledge, in the solution of our present important problem. An examination of current engineering literature will disclose the fact that very little space has been devoted to a discussion of the economics of city pavement maintenance and repair, and further examination will disclose the fact that with the possible exception of one or two books, which discuss the subject more or less briefly, there has been nothing comprehensive written regarding the science of this important subject. It is believed that municipal engineers and research organizations may profitably turn their attention for a time to a study of the economics of city pavement maintenance and repair, and to a campaign of education, which will bring to the attention of property owners the immense waste under existing conditions.

WATER FOR PRIVATE ESTATES

By Louis L. Tribus of Tribus & Massa, Consulting Engineers, 15 Park Row, New York, N. Y.

One of the results of the gathering of great wealth in this country is the development of extensive private parks to surround the palatial homes of their owners; homes which, except for size, have no rivals among the palaces of the Old World.

The engineer who designs a water system for a municipality can deal with average quantities and what might be considered normal use; he who serves the needs of these private estates has little but the whim of the owner as a guide to the quantity of water to be supplied.

It may not be uninteresting to present some notes from a recent development, in our firm's charge.

The estate consists of some 900 acres; 250 kept as the Owner's Park, the balance as farm and pasture. Two persons constitute the family, and from 65 to 90 outside employes the operating staff, plus the household and garage retinue. The owner occupies the property scarcely over four months a year, yet everything must be kept in perfect order, to be ready for visits without notice at any time.

Many features of the estate would be interesting to write up, but the water matters alone are to have attention here.

The farm group, a complete model small town, has its own springs, electric pumps, ornamental water tower, and distribution system, but of rather low pressure, so a set of fire mains and hydrants has been installed, served from the estate's main pumping station, ¾ mile away, supplying water at 135 lbs. pressure.

At the main station, water had been taken from a spring reservoir and some 20 shallow wells driven in a gravel stratum, yielding together some 150 or so gallons per minute, and pumped with electric and gasoline pumps through an extensive 4 and 6-in. pipe system to an elevated tank holding about 60,000 gals.

With the addition, however, of a great combination building housing recreation rooms, tennis court, and large swimming pool, for all the year round use, hence abundantly heated, more water was thought necessary, particularly as several acres of additional fine lawns have been added to the previously intensively cultivated area.

The inevitable—three deep wells have been recently driven, one about 600 ft. in rock, one about 500 ft., and one 300 ft., taking water partly from the rock and partly from overlying gravel.

The yield, some 400 gals. per minute, drawn up by electrically-driven deep-well pumps, is discharged into the spring reservoir, converted into a 35,000-gal. tank.

Two 500 g.p.m. electrically-driven centrifugal pumps draw from the reservoir and discharge into the elevated tank, and soon into a new 320,000-gal. 33-ft. diameter steel standpipe.

In short, a supply of about 800,000 gals. per day is provided for two people and their visiting friends, though of course it must not be overlooked that probably 40 or 50 employes living on the properties are also served with food, water and ice. The ice plant has capacity of 4,000 lbs. per day.

How can this water be used?

All normal and abnormal purposes in mansion, garage, stables, farm buildings, laundry, ice plant, swimming pool (55,000 gals. each time filled), fountains and pools (emptied every two weeks), many greenhouses, with steam heating and power plant, etc., and a dozen or more lawn sprinklers, always playing in hot weather.

Electric power, light and telephone cur-

rents are carried in underground cables, much of it in fibre ducts imbedded in concrete.

Surplus waters, from system and storm are gathered as quickly as possible and carried away underground, so as neither to entail surface damage or nuisance. Part of the electric current is generated on the estate, but most of it is purchased.

This development is typical; few small towns in the vicinity of such properties could supply such requirements, and only long purses could meet the costs.

COMMENTS ON WATER PURIFICATION PLANT DESIGN AT WARREN, OHIO

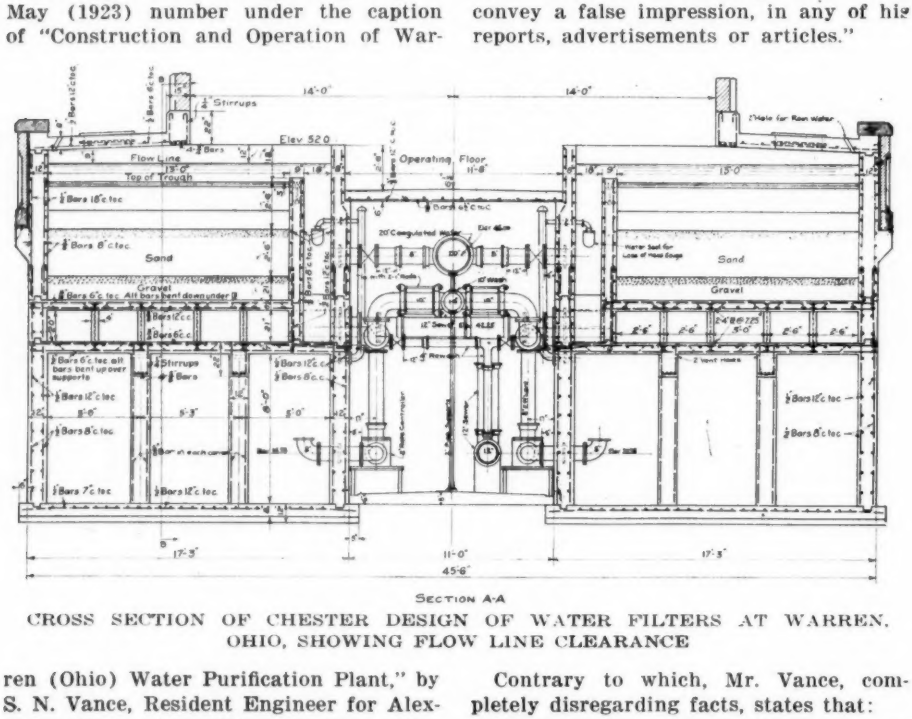
To the Editor:

I refer to an article appearing in your May (1923) number under the caption of "Construction and Operation of Warren (Ohio) Water Purification Plant," by S. N. Vance, Resident Engineer for Alexander Potter, Consulting Engineer, New York City, and P. J. O'Connor, Superintendent of Filtration, Warren, Ohio, and especially that paragraph referring to a plant which was designed by us which reads:

"Unfortunately the plant was not so designed that it could be added to sufficiently to become a big plant; therefore it could not provide but for a short time for the increasing demand for water, for both industrial and commercial uses. The size of the units were entirely too small, as a big plant with small units is very expensive to operate. In addition to this big handicap, the back half of each unit was covered with a low flat roof, which touched the water. The ice formation was therefore bad and in a very awkward place to remove. The coagulating basins were not covered and the ice formation caused the wall to crack."

On which my first comment is that it is a pity that Mr. Vance could not have had before him the article appearing in the same number entitled, "Specific Principles of Good Professional Conduct for Engineers," the sixth paragraph of part one of which reads:

"He (the engineer) should avoid any questionable statements or any statements couched in language that would convey a false impression, in any of his reports, advertisements or articles."



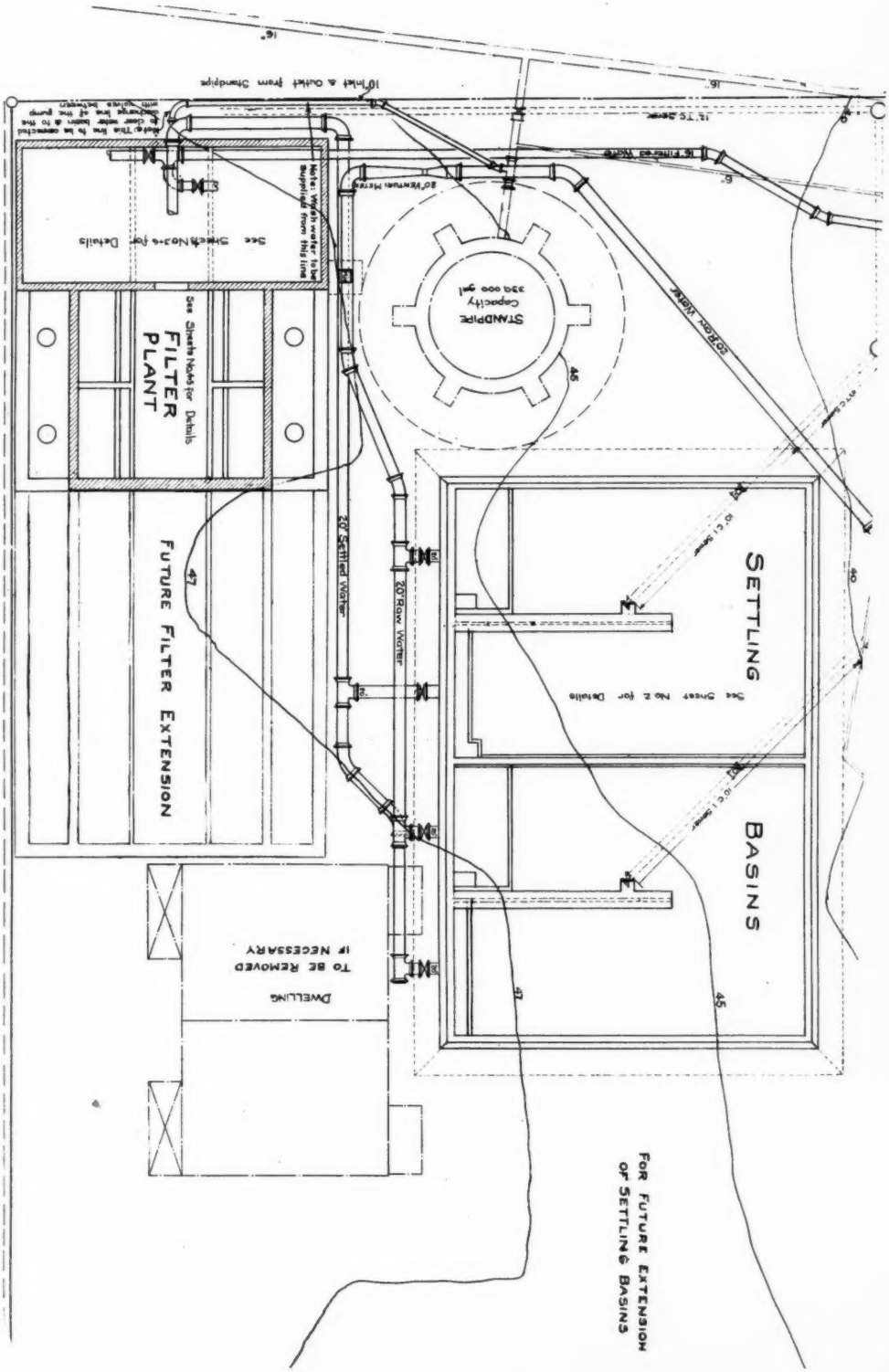
SECTION A-A

CROSS SECTION OF CHESTER DESIGN OF WATER FILTERS AT WARREN, OHIO, SHOWING FLOW LINE CLEARANCE

Contrary to which, Mr. Vance, completely disregarding facts, states that:

"Unfortunately the plant was not so designed that it could be added to sufficiently to become a big plant."

Contradicting this, we submit the plan herewith which shows a dwelling that was removed and from the faint lines you will note, at the time this drawing was made, means for extending it from a two-million or a four-unit plant to a six-million or twelve-unit plant were indi-



LAYOUT OF CHESTER DESIGN OF WARREN (OHIO) WATER PURIFICATION PLANT SHOWING SUGGESTED FUTURE EXTENSIONS

cated, the position of the extended settling basin being shown also.

Please note, too, that the filter plant could be extended indefinitely and as there is other real estate where settling basins could be built, Mr. Vance's statements are surely in gross error. He further states that:

"The size of the units were entirely too small, as a big plant with small units is very expensive to operate."

We should like Mr. Vance to sustain this statement with facts. He further adds:

"In addition to this big handicap, the back half of each unit was covered with a low flat roof, which touched the water. The ice formation was therefore bad and in a very awkward place to remove."

Contradicting this, we submit a cross-section whereon the flow line of these filters will be shown to approach a minimum of 9 ins. of the rear deck and we further submit that the design of these filter tubs is after a standard that has been incorporated in the major portion of all of the concrete filters built to date in the United States and, further, the designers of these plants have designed more than 50 similar plants and have yet to obtain their first experience with ice inside of a properly cared for filter building, or, let us contend that an interior temperature that would freeze ice under this deck would play havoc with the pipe in the gallery. Mr. Vance further continues:

"The coagulating basins were not covered and the ice formation caused the wall to crack."

Since the major portion of the coagulating basins in the United States are likewise uncovered and some attention is expected to prevent ice forming to a destructive thickness, we can only reply that we are still designing and building open settling basins. We are also employing manually controlled valves and feed devices in plants where our clients fail to furnish sufficient money for more expensive and luxurious elements.

Very truly yours,

J. N. CHESTER,

The J. N. Chester Engineers, Union Bank Bldg., Pittsburgh, Pa., June 6, 1923.

(Mr. Chester's letter was brought to the attention of Mr. Vance, who is now in the employ of the city of Warren, and he has written the following reply.—Editor.)

To the Editor:

I am sorry Mr. Chester is offended as I most certainly did not intend to offend. It was our intention to state facts only.

In stating that the plant could not become a big plant our reason was also given; that is, that the tubs of this size would be expensive to operate. We might also have added that the cost of constructing small tubs is expensive, as compared with the larger ones. I note that Mr. Chester states that the plant was designed with a view of a possible extension of from two to six million, or a twelve-unit plant. That is very nice, but even at this it most certainly would not be a big plant. I feel that there is no argument along these lines.

As to the 9 ins. between the water line in the tubs and the decking above, this no doubt was based on a normal rate of filtration, but with 100 per cent over rate there was no space and there was an ice formation, but with none of the pipe in the gallery freezing.

The coagulating basin not being covered was not mentioned as a criticism but what we believe to be the cause of the concrete walls cracking. The ice formation on the basins has been as much as 4 ft.

In a two-million gallon plant of four units, manually controlled apparatus is of course proper. The apparatus is all small and can easily be operated and at no great loss of time.

Very truly yours,

S. N. VANCE,

Warren, Ohio, July 30, 1923.

MUNICIPAL RECREATION IN THIS RESTLESS AGE

By Eugene T. Lies, Special Representative, Playground and Recreation Association of America, 21 N. LaSalle St., Chicago, Illinois.

No very acute perceptions are needed to enable anyone to see that we are living in a restless age. The signs of it are on every hand. A four year, world wide debauch of man-killing could leave no other effect in its wake than an International Pounding Headache and a confused wonderment as to whither we are drifting, whether toward the millennium or toward chaos.

The unity of marshalled forces has given way to the centrifugal scrambling of groups and individuals.

Youth of our day is asking searching

questions of the elders as to the very purpose of life. It is casting aside old sanctions, it is hammering away at what many declare to be the very ramparts of civilization. It is fed on wonders from infancy up and is ever praying lustily; "Come on, give us this day, our daily thrill."

The one hundred thousand youthful delinquents who go through our courts yearly and the existence of three hundred thousand adult professional criminals in the United States, are further indications of the fact that we are a "restless people." Our crime bill runs up to at least a billion and a quarter dollars per year.

In industry, the almost universal use of the automatic machine, which calls not for brains but only for muscular dexterity on the part of the worker, is destroying creative ingenuity and producing revolt in great numbers of toilers, who necessarily, therefore, demand all kinds of excitements as a means of spiritual compensation.

The sudden change from a national wet to a national dry or rather "near-dry-era," is undoubterly figuring in the restlessness of our time and it behooves us to apply effective substitutes for producing those human satisfactions supposed to have been supplied by King Alcohol.

Again, alienists are crying out louder than ever before to us Americans, that we are living too fast in this complex age and that we must either get into lower gear or be prepared to build evermore sanitariums and asylums to take care of the increasing number of nervous wrecks. The abnormal people of all types, now in public institutions, are already costing the taxpayers over $3,000,000 per year.

It is clear enough from the evidence at hand that what we need in our beloved America, is a widespread application of such influences as will steady and upbuild human life and satisfy legitimate deep instincts of our people. In self-expressive recreation can be found just such influences. For the child play is creation. Deprive him of it and you check normal growth and ability to meet the distracting, downpulling tendencies of our strenuous era. For the adult play is recreation. It makes him over, mellows him and prolongs his life.

Commercialized amusements, together form our biggest industry and unfortunately absorb too much of the leisure time of the people; 74,000 persons attended the opening of the base-ball season in New York. Nearly 20,000,000 go to the movies every day and while we do not oppose wholesome profit-making amusements, we do point out that, in view of prevailing conditions, the great need of the hour is for self-participation "in the game." Muscles shrivel for want of exercise: get out on the vacant lot and bat the ball and run the bases. The craving for happy companionship, improperly satisfied, can lead to the morals court or if wholly unsatisfied, to the asylum: get into the social center or the neighborhood club and have that jolly good time. The inner demand for a chance to create something beautiful, if quenched, means irritation and possible outbreak: go where they sing together, get an instrument, though it be only a mouth-organ or ukelele; buy a box of paints and start something; or contrive to get a part in that play or pageant they are putting on at your church.

The Playground and Recreation Association of America is trying to arouse the leaders in the church, the school, the women's organizations, parent-teacher, labor and commercial bodies, as well as the public officials, to the tremendous possibilities in the field of recreation for meeting some of the needs of our time, especially now when there is more leisure to dispose of than ever before in our history on account of the eight-hour day and the prevalence of labor-saving devices.

The organization which I represent is ready, with its 17 years of experience, to help cities and towns to understand their play needs, formulate community programs for leisure-time activities, in which all organized groups can have a part. The results will be more parks and playgrounds, larger use of the schools during evening hours and of the churches and clubs as community centers, wider service by the Y. M. C. A., Y. W. C. A., Boy and Girl Scouts, etc., thus promoting health, happiness, morale and satisfaction of all the people. Crime will be nipped in the bud. The loyalty of the people to their home town will be stimulated. Much of the "wreck" will be taken out of recreation and more "unity" will be put into the community. The city without a play program, as part of its municipal plan, is like an ostrich with its head in the sand. It fails to see its danger. It is pleasanter to pay a recreation bill than a crime bill—and so much cheaper. In this field lies not only a responsibility of first rate importance for our public officials but

also an opportunity of the richest imaginable sort.

The foregoing is a resume of an address by Mr. Lies before the League of Wisconsin Municipalities on June 12, 1923.

A GRAVITY WATER SUPPLY FOR WELLSVILLE, OHIO

By W. J. Sherman, Consulting Engineer, 302 Produce Exchange Bldg., Toledo, O.

Wellsville, Ohio, is a city of 9,000 population, situated on the right bank of the Ohio River, 50 miles below Pittsburgh. It has always depended on the Ohio River for a water supply. In quantity, it was and is never-failing, but the quality has been retrograding steadily with the rapid industrial growth of the Pittsburgh District.

The agitation for a better water supply for this City has been going on for more than ten years. Meanwhile, reports from engineers have been submitted from time to time and consideration has been given to the following sources of supply, to-wit:

(a) A filtered supply from the Ohio River.

(b) A purchased filtered supply from East Liverpool, four miles up the river.

(c) A drilled well supply with wells located along the river bank near the existing pumping station.

(d) A supply from Little Yellow Creek with a pumping station and filter plant.

(e) A gravity supply from an impounding reservoir, located in the Valley of Little Yellow Creek, a small stream discharging into the Ohio River within the city limits.

Inasmuch as all five of these projects would furnish water requiring either filtration or softening or both, the problem naturally resolved itself into one of relative dependability and relative economy in initial cost and cost of operation.

Without going into the advantages and disadvantages of these several projects at this time, we may say in brief that the gravity supply easily won out on its merits and in due time was given official endorsement. Plans were prepared and approved by both City and State. Bids were received on Feb. 14, 1923, on what may be termed the 1923 project, which did not include filtration, for lack of available funds. Contracts were awarded as follows, largely on a unit price basis:

Cast Iron Pipe—The United States Cast Iron Pipe & Fdy. Co.	$ 56,029.40
Valves, Valve Stems and Floor Stands—The Ludlow Valve Mfg. Co.	2,472.47
Pipe Laying—The Allison-Harris Construction Co.	53,428.20
Reservoir and Dam—A. W. Hinaman	110,332.97
Total amount of award	$222,263.04

The above figures represent the summary of costs, based upon the application of the unit prices of the successful contractors to the preliminary estimate of quantities as determined by the engineers. We believe it is generally conceded that the unit price basis is more satisfactory to the city and its engineers because of its flexibility, besides being safer in all respects for the contractor. The city pays for what it gets and the contractor is paid for what he does. The elements of doubt and uncertainty are largely eliminated.

The 1923 project, so-called, includes a reservoir, an earthen dam and the cast iron pipe conduit, leading down to a connection with a distribution system of a municipal water works.

A later project will include a modern mechanical filter plant, which will not in any respect interfere with the gravity features of the present project.

The reservoir with an impounding capacity of 140,000,000 gals. and a drainage area of 16 sq. miles, is expected to provide sufficient storage to meet all requirements of the City for many years to come.

In the design of the earthen dam and the spillway in connection with it, the engineers were fortunate in having access to the United States precipitation records in this vicinity, covering continuously a period of 40 years. The season of minimum precipitation (28.02 ins.) was naturally used in determining the storage capacity of the reservoir and the minimum available run-off from the drainage basin. The season of maximum precipitation (54.98 ins.) determined the dimensions of a spillway and tail race and their elevations.

The flow line of the reservoir will be 243 ft. above the gage at the existing pumping station, 282 ft. above low water in the Ohio River and 225 ft. above the business center of Wellsville, thus according a fairly satisfactory domestic and fire pressure by gravity at all times.

Some of the features of the 1923 project are here summarized as follows:

Reservoir capacity	140,000,000 gal.
Flooded area	26 acres
Mean depth of water	16.5 ft.
Length of spillway	200 ft.
Drainage area	16 sq. miles
Length of dam	450 ft.
Maximum height of dam	60 ft.
Earth work	73,126 cu. yds.
Masonry	1,625 cu. yds.
Dry riprap	6,285 sq. yds.
Grouted riprap	2,048 sq. yds.
30-in. cast iron pipe	300 ft.
18-in. cast iron pipe	1,056 ft.
16-in. cast iron pipe	16,274 ft.

The reservoir is provided with a gate house, controlling the inflow of water from the reservoir at three separate stages and supplying therefrom the main conduit. The gate house is a substantial structure of concrete, circular in form and having an inside diameter of 9 ft., with the operating floor placed 54 ft. above the footings. Hand-operated floor stands control the three 18-in. gates over the inlet port, and one 30-in. gate at the drainage port.

A 30-in. cast iron pipe passes through the base of the dam, serving the double purpose of a water supply for a main conduit and a drain to the main reservoir. Near its lower end is a gate chamber controlling the flow, either into the main conduit to the City or directly into the creek below the dam.

The main conduit passes down the narrow and crooked valley, or rather gorge, of Little Yellow Creek, crossing that stream 15 times en route to a connection with the existing distribution system of the Wellsville municipal water works plant.

At this writing practically all water pipe, valves and special castings have been delivered and all construction operations are well under way.

SOME ACCOUNTING PROBLEMS IN MUNICIPALLY OWNED WATER WORKS

By George C. Mathews, Statistician, Railroad Commission of Wisconsin,, Madison, Wis.

One of the most common misconceptions as to the Railroad Commission of Wisconsin has arisen because of a failure to understand that the Railroad Commission does not establish the policy of the State with regard to the regulation of public utilities. This has perhaps been more true in the case of some of the municipally owned utilities than in the case of those privately owned. Although in general the cities which own utilities have accepted the regulation of those utilities by the State as not undesirable and as leading to desirable results in many cases, the situation has not been entirely free from some feeling that the Railroad Commission was interfering with powers and duties which should be solely within the control of the city administration. The development of the spirit of municipal home rule has seemed antagonistic to control of municipal utilities by the Commission and although the attitude of the cities generally has been one of co-operation and has evidenced a genuine desire to conform to the letter and spirit of the public utility law, it has perhaps been only natural that in some cases there has been a feeling that the Railroad Commission has been interfering with matters of a purely local nature.

I think that this situation is very largely cleared up and that the cities have generally come to realize that the Railroad Commission has no desire to interfere with local affairs and that where it appears that there is interference the Commission is only doing what the legislature has commanded it to do. We must bear in mind that the Railroad Commission is an administrative body and an administrative body only. It has no powers or duties except those which the legislature of the State has commanded it to exercise. It has no more right to fail to do the things which the legislature has commanded it to do than it has to attempt to exercise powers which the legislature has not given it. The legislature, in turn, perhaps not perfectly but at least as perfectly as any system of government permits, expresses the will of the people. The public utility law as originally passed and as amended from time to time represents as nearly as possible what the wishes of the majority of the people of the State are in public utility regulation.

Municipally Owned Plants Have Same Regulation as Privately Owned Plants in Wisconsin

At the time the law was passed one of the important questions which the legislature had to settle was whether the municipally owned utility should be subject to the same regulation as the utility owned by private capital. Wisconsin was not alone in having this problem presented to its legislature. Probably in every state which has laws regulating public utilities the same question was before the legislature. In some of the states the legislature decided that the state would not, through an administrative agency, regulate utilities owned by cities

and villages. In Wisconsin the legislative policy was different. The decision was that municipally owned utilities should be subject to the same regulation as was applicable to private companies. The same provisions of the law regarding rates, service, and practices prohibiting discrimination and requiring uniform accounting, with one very minor exception in the matter of accounting, apply to the municipally owned plants and to the private plants alike. The Railroad Commission does not and cannot go any farther in regulating municipal plants than private plants and, if it performs the duties which it is sworn to perform, it cannot administer the law any less fully with regard to the municipal plants. The policies of regulations have been fixed, not by the Railroad Commission, but by the legislature and by the people of the State. The Railroad Commission is the instrument created by statute to carry out the legislative will. It has no other powers or duties, and consequently when we deal with problems affecting the regulation of municipally owned utilities we must bear in mind that fundamentally we are dealing with policies of the state and that the actions of the commission are only intended to carry into effect those policies.

Governmental and Proprietary Capacities of Cities

Judicial decisions recognize quite clearly that a municipality may and usually does function in two distinct capacities. In administering its city offices, its police and fire departments, in raising taxes, it operates in a governmental capacity. It decides such matters of policy and carries out such legislative and administrative acts of government as it has been empowered to carry out by the State.

But when the municipality enters into the conduct of a business as it does when it operates a public utility there is a general recognition that it is functioning in a different capacity. It has become the proprietor of a business enterprise and functions in a proprietary capacity.

Some Phases of Accounting

I have been asked to speak with reference to some phases of the accounting of municipally owned water utilties. I think that it may be best to confine the discussion of accounting matters to such phases of accounting as are involved in the relations between the city as a proprietor and the business which it owns. I think we all recognize that it is fundamental that the proper conduct of any business involves a correct accounting for monies received and disbursed and in some of the activities of the city this may be substantially all that is involved in proper accounting. Where the city enters the conduct of a business, however, it assumes toward that business the same relation which you or I as individuals would assume toward a business which we own and it assumes a relationship toward the business substantially the same as that which the stockholders of a corporation have toward the business which they own. Whether or not the business is successful cannot be judged entirely by whether the cash receipts exceed the cash disbursements. From a financial standpoint the success of the business must be judged by the degree to which it meets all obligations to its proprietor.

The City Equity Account

The account which measures the proprietor's investment, using the term investment in its narrower sense, is the city equity account. This account shows the total of money which the city has transferred from the general fund to the utility. The chief difficulty which we have experienced with regard to this has been due to the failure of the city authorities to appreciate fully the nature of the account. The sources from which a municipal utility derives its capital are in general four:

1. From the sale of bonds which may be either general city bonds or obligations secured by the utility property.
2. By transfer from the general fund of monies in that fund which may have been derived from a number of sources.
3. By the investment in property of earnings reserved to cover depreciation or to provide operating reserves of various kinds.
4. By the investment in the property of earnings which properly constitute a surplus arising from operations.

The Credit Balance

In order to show correctly the relation of the utility enterprise to its proprietor it is necessary that the balance sheet of the utility show correctly the credit balance in accounts representing the sources of funds which are invested in the utility. The city equity account then corresponds to the direct proprietorship account of an individually owned enterprise and represents the investment which the city has made in the utility from its general funds which could have been devoted to other purposes if not invested in utility property.

The Funded Debt

The second balance sheet account which should be stressed is that representing the funded debt whether that debt constitutes a general city liability or is merely a mortgage upon the utility property. In a narrow and strictly technical sense it may appear contrary to good accounting principles to show upon the balance sheet of the utility a funded debt which is a general city obligation. In a narrow sense it might be argued that what the utility balance sheet should show is simply a division of the city equity representing the amount of funds which the city has raised by the issue of general city bonds which funds have been transferred to the utility department. There is, however, a provision of the statutes which provides that before any funds resulting from utility department earnings can be transferred to the general fund, the principal and interest on funded debt must first be met. The effect of this seems to be to recognize the funded debt as an obligation of the utility even though it is also a general city obligation and we have therefore recommended that bonds outstanding, whether simply mortage bonds secured by the utility property or general city bonds issued for utility purposes, should be shown upon the water works balance sheet.

Earnings Reserved

The third source of utility capital which has been mentioned is the investment of earnings reserved on account of the necessity for ultimately retiring the property or earnings reserved for other operating purposes. In some cases city and village officials have questioned the necessity for providing a reserve for depreciation inasmuch as the city could not well, under any conditions, escape its duty to continue the utility business permanently. We have, however, had at least one instance in the State where the city's inability to borrow money prevented for a material time very important changes in its water works system. To some extent at least, the unfortunate results of this situation could have been avoided if a reasonable provision for depreciation or for ultimate retirement of property had been made throughout the operating history of the utility and earnings so reserved furnished one of the sources of capital to that extent relieving the strain on the borowing power of the city. We have also had a number of instances where municipally owned electric utilities have been permitted to get into bad shape and in some cases have been transferred almost without cost to private companies. In such cases the failure to recognize and provide for accruing depreciation has undoubtedly been one of the factors which led to the abandonment of municipal operations.

Confusion Between Surplus and City Equity

In a number of cases where the importance of the city equity account has not been fully appreciated, utility balance sheets have been returned to the Commission showing a surplus out of all proportion to the actual profits which have arisen from operation. That is, the officials have had in mind that where a city had retired its bonds which were issued for utility purposes, there being no longer any evidence of indebtedness against either the utility or the city, that it was fair to throw into a surplus account the excess of assets over accounts payable and depreciation reserve. It is true that there is no instrument evidencing the liability to the city on account of general funds which have been invested in the utility property either directly or through the retirement of such bonds by city funds, but to show as a surplus the excess of assets over accounts payable and reserves gives a misleading impression as to the history of earnings in the utility department. If the city has retired its bonds out of general funds it has in effect increased its own direct investment in the utility; that is, the city equity, and to show as a surplus amounts which should be shown as city equity is unfortunate in accounting because of the incorrect impression which it creates as to earnings. The surplus account should as a general thing show only the surplus resulting from the excess of earnings over expenses of the utility department.

Life of Plant

A utility business, such as the water works business, is a business of indefinite duration. Individual unity of property wear out and have to be replaced or become inadequate and consequently have to be removed, but, so far as any of us know, the business itself will last as long as the locality lasts. Property is used up in the furnishing of water service and unless the books of the water department give effect to this condition they will not properly state the relationship of the utility to its proprietor. The city has put its money into the water plant, the plant is being consumed in public service. The balance sheet of the plant should show as a liability; that is, an obligation to the city, the extent to which there has accrued

a liability to retire property. This, of course, is a more or less indefinite amount since none of us know how long a property will really last, but the difficulty of making a proper estimate does not lessen the importance of making the best estimate that we can nor does it alter the fact that unless the books of the water department show as nearly as can be estimated the extent of this liability they will not correctly reflect the relation of the department to its owner.

Four Important Accounts

So far as conditions on any given date are concerned, therefore, there are four accounts which have seemed to the Railroad Commission of great importance in properly expressing the relation between the city and its utility business. One of these accounts which we have called the city equity should show the direct investment of the city. Another should show the liabilities in the form of debt whether secured directly by utility property or by the general city taxing power. A third account is the reserve for retirement of property, or the depreciation reserve, and the fourth is the surplus or deficit account. Failure to distinguish between these accounts and to recognize properly the amounts which should appear therein means that the true financial condition of the business in which the city is engaged is improperly represented. For a private corporation to send out a statement to its stockholders which would incorrectly represent the relationship of their business to themselves would be a rather serious matter but unfortunately in municipal accounting we have not in all cases reached the point where officials have realized that taxpayers of the municipality should be furnished with as complete and accurate a statement as the stockholders of a corporation.

Accounts Bearing on Results of Operation

I have spoken of the balance sheet accounts which are particularly of interest in reflecting this relationship between the owner and his business as of a given date. In conducting that business during the fiscal period there are certain accounts which are of utmost importance as they have a bearing upon the results of operation. Those of which I wish to speak are:

1. A provision in lieu of local taxes.
2. A provision for the accruing depreciation or the accruing liability to retire property during the operating period.
3. The provision for interest upon the money invested.

In Lieu of Local Taxes

We are often met with the criticism that making a provision for local taxes simply amounts to transferring money from one pocket to another. That is in a sense exactly what is done. Proper accounting is facilitated if the city funds are placed in two pockets—one for general funds and one for utility funds, and unless all of the obligations which are owed either directly by the utility or are assumed by the city on its account are paid out of the utility pocket, the cash in that pocket will incorrectly reflect what has happened in the operation of the utility. When a city buys a water works plant it removes from the tax roll an industry which has been paying taxes to the city. It does not thereby decrease the total amount of taxes which it is necessary for the city to secure and consequently either one of two things must happen, either the taxes on other property must be increased to make up for the loss of taxes in the property acquired by the municipality, or the earnings of the uitility department must be sufficient that there may be returned to the city from those earnings an amount in lieu of local taxes which have been foregone. Some of the cities are actually getting this result, it is true, without placing on their books any account under the name of taxes, but in order that the results of operation may be correctly obtained the burden which is assumed by the city when the water works property is withdrawn from taxation should be placed upon the water works property under municipal operation and definitely measured and accounted for.

Provision for Accruing Depreciation

Since property is used up in operation, customers receiving service at the time of its use should pay enough to protect the city against the loss of that property when it is retired. A great deal of confusion has apparently resulted from the requirement of the uniform classification of accounts regarding depreciation, in that some utilities have understood this to require the setting aside of cash in a special fund. It is the common practice in municipal utilities to retire outstanding bonds serially. Naturally, any provision for creating and retaining an actual fund to meet the cost of replacements has seemed an unnecessary burden and such a fund is not required by the accounting system prescribed by the Railroad Commission. If available funds are used to retire bonds and thus decrease the operations on account of the utility, the financial position of the city and the utility is strengthened

to that extent and provision for depreciation is really made. It is not contemplated that provision for depreciation means the segregation of cash and its retention in a special fund, but it is important that when the cost of furnishing service in any year is stated there should be included as part of that cost the value of the property used up in operations of that year as nearly as can be determined, and the rate schedule under normal conditions should provide for that element of cost as well as for others.

Interest on Obligations

I have spoken also of the question of the interest on obligations. If there are bonds outstanding it is easy to see that interest to be paid on these bonds is a cost of the utility service. If the bonds have been retired, however, it is not always so clear that an element of interest must still be considered in getting at the real cost of service. If you are the sole proprietor of a utility business and if you have retired all indebtedness against that business out of your own funds, you would still hardly consider that business successful unless it paid you the equivalent of interest on your investment. The city is no different in its proprietary capacity than you would be as an individual. The city's utility business is not financially successful even when no bonds are outstanding unless it returns to the city the equivalent of interest on the city's investment. That investment represents a sacrifice by taxpayers of the city and the withholding of that amount of their money from other investments. It is not fair that taxation upon property at the present time or in the past should be utilized to furnish the money for a city business unless that business is to pay interest to the city upon the money so that there will be a return to the taxpayer in the form of lowered taxes in the future.

Value of Services of City Officials

One other point might be mentioned at which municipal accounting has very generally failed to show the cost of utility service. This relates to the value of services furnished to the utility by municipal officials and not charged for on the utility books. It is perhaps more true of the smaller cities and villages than of the larger ones, but in a great many of them some portion of the time of city officials for which salaries are paid out of the general fund is devoted to utility business. The city clerk is often the secretary of the water commission; the city treasurer often does the collecting, yet in many cases the cost of the utility business as stated on the reports of that business does not include any provision for these expenses.

Desire for Proper Accounting Is Increasing

The one simple principle of which we have tried to secure the observance is that the accounting in municipally owned utilities should be such that on any given date the relation of that business to its owner may be properly stated and that for any given period the revenues and the true cost of conducting the business may be correctly shown. To this general statement of the purposes probably few people would take exception, yet the attempt to secure this in municipal accounting has met in many cases with very decided opposition. It should be stated, however, that this opposition is becoming less and less and that in the main the municipalities owning and operating water plants have shown a willingness and a desire to have proper accounting in their utility business. There is one feature of the law which seems to me to be inconsistent with a requirement for proper accounting. This is Subsection C of Section (11) of Chapter 6606 and provides that "The income of a public utility owned by a municipality shall first be used to meet operation, maintenance, depreciation, interest and sinking fund requirements, additions and improvements, and other necessary disbursements or indebtedness. Income in excess of these requirements may be used to purchase and hold interest-bearing bonds issued for the acquisition of the utility or bonds issued by the United States or any municipal corporation of this State or may be paid into the general fund."

Transfer of Utility Funds

This apparent restriction on the transfer of utility funds to the general fund is almost impossible of acurate administration. Nobody can tell in advance just how much of the funds of the utility are going to be needed for additions and betterments and yet if it is not intended that an estimate shall be made of future requirements this section would practically mean that any cash balance could be transferred, which is evidently not its intention. There seems to be no reason why the funds of a utility department, insofar as their payment to the city is concerned, should be subject to different rules or principles than would govern the funds of a business operated by an individual. Sound accounting and sound economic practice should prevail in both

cases but the importance of an artificial restriction is not evident.

The result of this attempt to restrict the city's right to possess itself of funds which are undoubtedly its property has been to promote the feeling that the city and the utility should be considered as entirely distinct organizations. We have had a number of instances in this State where the city has not furnished any money for years for the construction of utility property. Since the law requires that any available utility funds must be devoted to construction purposes ahead of any privilege of transferring them to the general fund, it has not been uncommon for the cities to feel that this meant that the utility should furnish all the funds for its financing and it has been difficult to overcome this impression. It seems to me that a law properly devised to permit the transfer of any true surplus of a municipally owned utility to the extent that that surplus is represented by funds on hand would go a long way toward creating a proper relationship between the city and its utility department and that as long as an artificial restriction is placed upon the transfer of utility funds there is bound to be a tendency for city officials to feel that the utility should furnish all of its funds.

The foregoing paper by Mr. Mathews was presented at the recent annual meeting of the League of Wisconsin Municipalities.

DATA ON THE LIGHTING OF STREETS AND HIGHWAYS

By A. R. Knight, Asst. Prof. of Electrical Engineering, University of Illinois, Urbana, Ill.

The question of lighting city streets is one that has always commanded interest because of the intimate connection between illumination and safety and convenience; and the methods used have been changing constantly. During our own lives we have seen used successively gasoline lamps, gas lamps, various forms of electric arc lamps, and lastly, incandescent electric lamps. Today the incandescent lamp is replacing the other methods, therefore only lighting by incandescent lamps will be discussed in this paper.

Rapid Development of Lighting Units

At no time has any one of the various methods commanded the field long enough to establish itself as the standard method. This has been due partly to the rapid development of lighting units, a development which is progressing as energetically now as at any earlier time, as well as to the constantly changing conception of what is desirable. Until a few years ago comparatively no attention was paid to the esthetic side of street lighting, the idea simply being to have more or less illumination supplied. At present, the matter of general appearance is given practically the same weight as the degree of illumination, and the units to be used are selected as much for their effect upon the appearance of the street as for their efficiency and light distribution.

In the lighting of streets, pedestrian and vehicular traffic must be considered. The ideal condition for pedestrian travel is illumination that is not necessarily intense but which is uniform. This condition of uniformity is not so important for vehicular traffic, as will be pointed out later. Uniformity of illumination demands lighting units located at short intervals, a requirement that is met naturally by an ornamental system.

Four Classes of Streets

Streets can be divided into four distinct classes: (1) residence streets, the traffic on which is due mainly to the residents on the street itself; (2) residence streets handling considerable through traffic; (3) semi-business streets, those on which retail stores and residences are intermingled or streets given over to wholesale and storage houses or factories; and (4) main retail streets. On the streets of all but the first class other factors than those mentioned will enter. For instance, it is a recognized fact that high intensity of illumination has a decidedly stimulating effect and for this reason the main retail districts should have an illumination greatly in excess of the actual needs for safe travel.

Intensity of Illumination

Intensity of illumination is spoken of in terms of foot candles. A foot candle is the intensity of illumination on a surface 1 ft. from a source of one candle power or 2 ft. from a source of four candle power, etc. The following minimum intensities of illumination represent present practice fairly well: Purely residential streets, 0.02 foot candle (this is about equal to bright moonlight); boulevards or through streets and semi-business streets, 0.04 to 0.05 foot candles; main retail streets, 0.1 or more foot candles. To determine the size and spacing to produce the above degrees of illumination, it is necessary to know the distribution of

of light given by the lamp. The shape of the distribution curve can be controlled by the shape of the surrounding globe or by reflectors or by both together.

Comparison of Three Tops

A comparison will be made of three styles of tops, a ball globe, a top shaped to produce more downward light and a top using a prismatic refractor. A minimum illumination of 0.02 foot candles can be obtained with the lamps of 100 c.p. alternating on the two sides of the street and with spacings as follows, measured along the street: Ball globe, 90 ft.; shaped globe, 100 ft.; shaped globe and refracting dome, 117 ft. The comparative cost per 100 ft. of street for the standards and foundations is $672, $655 and $605, respectively. The saving in first cost shown by the second and third types is in a measure offset by the greater cost of glassware for replacing broken tops and this factor may, in some cases, lead to the selection of the first type. Where higher intensity is desired it can be obtained by using larger lamps or by placing the standards opposite each other or by both together.

Power can be supplied to the lamps either by means of a constant-voltage or a constant-current system. In the constant-voltage system (often called the multiple system) two wires are carried along the streets and 110 or 220 volt lamps are connected between them. The current to be supplied is the sum of the currents taken by the individual lamps and while the current taken by each lamp is small, the total may be quite large. The filaments in the lamps are long and of small diameter. This system is not satisfactory because the large current necessitates the use of large wire and also because the lamps do not withstand the vibration due to traffic well.

In the constant-current or series system the lamps are all connected in series, the same current flowing through all the lamps. This current can be made larger than that taken by a single multiple lamp but at the same time being much smaller than the total current in that system. If the current through a lamp is increased the voltage across it is decreased to keep the candle power the same. The total voltage of this system is the sum of the voltages of the individual lamps and may be built up to several thousand volts. The filament of the series lamp is shorter and larger than that of the multiple lamp and therefore it withstands vibrations better. For these reasons the series system is widely used and it is the system that will be discussed here.

Three Types of Series Systems

There are three types of series systems for supplying power to the lamps—straight series, straight series with current transformers at each standard, and the group system. In the straight series system, all of the lamps supplied by one regulator are connected in series across the regulator. If the district to be lighted is some distance from the control station, it is desirable to have as many lights as possible on one regulator to reduce the cost of cable from the station to the district. This results in the use of high voltage, which is undesirable for two reasons—(1) liability of injury to persons coming in contact with any part of the system; and (2) the high cost of cable suitable for such high voltage. On the other hand, this system has the advantage of simplicity, the equipment being reduced to a minimum.

In the series system with individual current transformers, an individual current transformer is installed in the base of each standard, thus insulating the lamp and leads up to the standard, from the high voltage carried on the underground cables. This system has the following advantages: (1) the life hazard present in the straight series system is eliminated; (2) if high power lamps are used the current transformers can be used to supply the large current required by the lamps while a smaller current is used in the line, thus reducing the cost of line copper required. When use is to be made of the small sized lamps, this advantage disappears. The disadvantages of this system are: (1) high initial cost; (2) increased number of sources of trouble due to the increase in the amount of equipment needed.

In the group system the lamps are divided into groups and one insulating transformer is used for each group. The advantages are: (1) the voltage of each group can be kept low enough to practically eliminate the life hazard present in the straight series system, nearly equalling in this respect the individual transformer system; (2) since the voltage for the entire group is lowered, a cheaper cable can be used than is required for either of the other systems. The disadvantages are: (1) the necessity of constructing manholes in which to place the group transformers; (2) a larger number of sources of trouble than with the series system. The following table gives

a comparison of the system with regard to possible voltage to ground from the lamp socket and the cost per standard. The figures given apply to 100 c.p. lamps installed in locations where it is possible to use parkway cable and assuming that 35 KVA regulators will be used to supply constant current to the entire circuit and that in addition 10 KVA series transformers will be used to supply the groups in the group system.

	Maximum Voltage	Cost per Standard
Straight series	5300	110.28
Individual transformer	11	135.28
Group	757	99.78

Mechanical Features

Cable for street lights can be installed in either of two ways. If conduit is laid in the ground, lead covered cable can be pulled into the conduit and connected to the various pieces of equipment. If no conduit is installed, lead-covered cable with two layers, each of steel tape and tarred jute around it, can be laid directly in the earth with no other protection, and connected to the various pieces of equipment. The main advantages of the conduit system lie in the fact that the cable can be replaced at any time without any excavation, while the advantage of the steel taped cable system lies in the lower first cost.

The type of lighting equipment to meet the needs of the different districts can be summarized as follows: (1) the residential section—100 c.p. lamps on 10½-ft. standards, alternate standards on opposite sides of the street, and steel taped cable; (2) the semi-residential section—250 c.p. lamps on 12½-ft. standards, spaced as above, and steel taped cable; (3) the semi-business section—250 c.p. lamps on 12½-ft. standards, spaced as above, and lead covered cable in conduit; (4) the business section—250 c.p. lamps on 12½-ft. standards placed opposite one another and lead covered cable in conduit. Alternate lamps on separate circuit to be turned out at midnight. Fairly typical costs per block of 400 ft. for the above layouts, using the group system, with an inexpensive standard and a ball globe are given below. These figures were worked out for a particular locality and are comparative only, local conditions affecting them. Court costs, supervision, inspection and cost of assessment roll for local improvements have not been included.

RESIDENTIAL LIGHTING

5 10½-ft. standards complete at $53	$ 265.00
5 20x20x24-in. foundations at $7.50	37.50
920 ft. 1000-volt steel-taped cable at $240 per 1000 ft.	220.80
50 ft. 1000-volt twin conductor lead-covered cable at $180 per 1000 ft.	9.00
0.40 KW station equipment at $43.40 per KW	17.32
0.40 KW distribution equipment (mains, manholes and transformers) at $246.40 per KW	98.56
Total	$ 648.18

SEMI-RESIDENTIAL LIGHTING

5 12½-ft. standards complete at $65	$325.00
5 24x24x30-in. foundations at $8.50	42.50
920 ft. 1000-volt steel-taped cable at $240 per 1000 ft.	220.80
60 ft. 1000-volt twin conductor lead-covered cable at $180 per 100 ft.	10.80
0.825 KW station equipment at $43.40	35.72
0.825 KW distributing equipment at $264 per KW	218.13
Total	$ 852.95

SEMI-BUSINESS LIGHTING

5 12½-ft. standards at $65	$ 325.00
5 24x24x30-in. foundations at $8.50	42.50
5 18x18x24-in. pullboxes at $22	110.00
920 ft. 1000-volt lead-covered cable at $100 per 1000 ft.	92.00
60 ft. 1000-volt twin conductor lead-covered cable at $180 per 1000 ft.	10.80
920 ft. 1-duct conduit in place at $1.60 per lin. ft.	1,472.00
0.825 KW station equipment at $43.30 per KW	35.72
0.825 KW distributing equipment at $264.40 per KW	218.13
Total	$2,306.15

BUSINESS LIGHTING

10 12½-ft. standards complete at $65	$ 650.00
10 24x24x30-in. foundations at $8.50	85.00
10 18x18x24-in. pullboxes at $22	220.00
1840 ft. 1000-volt lead-covered cable at $100 per 1000 ft.	184.00
120 ft. 1000-volt twin conductor lead-covered cable at $180 per 1000 ft.	21.60
920 ft. 2-duct conduit in place at $1.70 per lin. ft.	1,564.00
1.65 KW station equipment at $43.40 per KW	71.44
1.65 KW distributing equipment at $264.40 per KW	432.26
Total	$3,232.30

These totals give the following unit costs:

	Cost per Run. ft. of street	Cost per Property fnt. ft.	Cost per Stand.
Residential lighting	$1.41	$.81	$129.60
Semi-residential lighting	1.86	1.07	170.60
Semi-business lighting	5.01	2.88	230.62
Business lighting	7.04	4.04	323.23

Illumination of Highways

It is becoming desirable to furnish some illumination on the main highways in order to render the use of bright, glaring headlights unnecessary, thereby avoiding a number of accidents which are caused by glare blindness. The problem of highway illumination is greatly different from that of city streets. Since the traffic is almost entirely vehicular, uniformity of illumination is not of so great

an importance. The main object is to make it possible to perceive objects or bad spots ahead of the car. Three factors contribute to this perception: (1) direct illumination of the object by the light source; (2) silhouetting of the object against the bright area under the lighting unit; and (3) reflection from the surface of the roadway. Probably the least important is the direct illumination, and for this reason large units spaced fairly far apart can be used.

The lamps should be of the constant-current series type, for which a regulator is necessary. On the basis of 400 c.p. spaced approximately 400 ft. apart, one 35 K.W. regulator will light about 10 miles of roadway. The cost per mile for such an installation would be approximately $1,700 if a pole line is available, and it would only be necessary to support and string the wire and mount the lighting units; and approximately $2,500 if it is necessary to set poles.

The foregoing is a paper by Professor Knight before the 1923 convention of the Illinois Society of Engineers.

THE TRUTH ABOUT CANTONMENT CONSTRUCTION COSTS

By Dabney H. Maury, Consulting Engineer, 1445 Monadnock Block, Chicago, Ill.

(Editor's Note: The story of the cantonments has been written many times in this and other publications, but never, so far as we know, as well as in the following article. The economics of cantonment construction is still a live subject because of the charges brought against prominent men in the construction industry who were engaged on the work. The facts and figures here presented will be of greatest interest to engineers and contractors for reference purposes. The general public long ago accepted the false version as the true one and while the false may be forgotten the true will scarcely be embraced at this late date.)

The office organization charged by law with the construction and maintenance of barracks and quarters consisted in April, 1917, of some thirty persons: A Colonel, two Captains, an Engineer, an Architect and sundry Clerks and Office Assistants. It was at this crisis that there was appointed the Advisory Committee to the Committee on Emergency Construction of the Council of National Defense, to whose intelligence, patriotism, vision and genius were due the organization of the Construction Division, and to a very large extent the marvelous results accomplished by that Division.

Morton C. Tuttle of the Aberthaw Construction Company of Boston; Leonard Metcalf, of Boston; George W. Fuller, of New York; William A. Starrett, of New York; Frederick Law Olmstead, of New York and Washington, and Asa E. Phillips of Washington, were the men who, during May, 1917, laid the foundation for the organization of the Construction Division, selected its original personnel, and prepared the remarkable Cost-Plus-A-Limited-Fee Contract, which made possible the construction of the camps within the time limit specified.

One of the first things done by this Advisory Committee was to canvass the United States for the engineers who they thought would be needed. The members of the Committe knew personally or by reputation practically all of the prominent engineers in this country, and from these a list of 300 was selected. Each of these men received a telegram reading about as follows: "Will you give some of your time to work for the U. S. Government? o appropriation for services or expenses though one may be had later. Answer."

I saw the list and the answers. There were 299 "Yes's" and 1 "No." Those 299 men so selected formed the nucleus of the Construction Division.

To many of those same men this telegram was later sent: "Wire immediately names of Contractors in your vicinity who have the equipment and organization sufficient to enable them to complete from three to five million dollars worth of work in three months and whom you personally know to be fit to be entrusted with such work on a cost plus fixed sum basis."

The best contractors in the United States—and that means the best contractors in the world—were thus mobilized and staked out in advance for the Construction Division. When the time came those contractors thus selected each received a telegram to come to Washington—and in every case the response was immediate. Those men came down, brought their organizations, sent for their equipment, and went out to their jobs; and they worked there, in many instances, for three weeks, before they even saw the contract which they were expected to sign.

Under no other form of contract than that prepared by the Committe could this

work have been done on time, and under no other form of contract could it have been done at that time as cheaply as it was done. No sane contractor would have bid on a lump sum contract, even had plans and specifications been ready—which they were not.

The impression has gone abroad throughout the land that this contract was a cost-plus-a-percentage agreement, and that the more money a contractor spent or wasted, the larger would be his fee. This impression is absolutely false.

The contractor's fee for each of those great camps was limited to $250,000. The average fee earned by all of the contractors for the army camps was about 2½ per cent.

The camps themselves were far superior in every respect to any war camps which any nation has ever constructed. The buildings were better, their equipment was better, the commissary was better, the water supply and sewerage and general sanitation were better—the fire protection system, the electric light, the heating, the laundries, the hospital service—were all superior to any ever enjoyed by troops in training during war time anywhere in the world.

The 16 army camps were built to house about 640,000. Their total cost was $198,000,000. This represents $300 per man, and for this sum there were given comfortable quarters, plumbing, heat, light, water supply (hot and cold), sewerage and sewage disposal, garbage disposal, fire protection, roads, pavements, railroad facilities, warehouses, laundry, and a large and splendidly equipped hospital. Let any man take his pencil and figure the cost of similar accommodations and facilities to the average citizen today and then say whether or not these camps were costly.

The water supplies for the 16 National Army cantonments cost $11 per capita. Any man familiar with the cost of water works will tell you that the water works of the average city of 40,000 people in this country could not possibly have been reproduced new in 1917, for less than $55 per capita.

The purity of the water furnished by the systems installed or enlarged by the Construction Division is best attested by the fact that these water works systems handled during a period of two years, in about 350 places in the U. S. and its Island Possessions, more than 4,000,000 troops and more than 2,000,000 civilians, without one single case of typhoid or other water-borne disease being charged to the impurity of any supply.

The adequacy of the supplies is shown by the fire record. The camps were of the most inflammable construction, and thousands of fires were started; but in only three instances was any fire allowed to escape beyond the building of origin, and in each of these three cases one-half of the barracks building in which the fire originated was saved, and one-half of the mess kitchen to which it spread.

The per capita fire loss for the year 1918, throughout the U. S., was $2.67. The per capita fire loss in the army camps and other Construction Division activities was 67c for the same period. More than half of this 67c was the loss in hay piles, which were located in the corrals, beyond the reach of the water mains in the camp, and for which no attempt was made to provide fire protection.

It seems hardly necessary to say that the credit for these results belongs to no one man, but is shared by every one of the thousands of men, not only in Washington, but in the field, whose duties brought them in touch with the design or construction of the work.

But above all and beyond all other considerations was this great fact. Each day by which the arrival of American reinforcements in France was delayed meant from 5,000 to 10,000 allied soldiers killed, from 50,000 to 100,000 more wounded, and several hundred million dollars of war expenditures, and endangered to a frightful extent the fate of the world—for without the speedy arrival of American troops the war would have been lost.

Thanks to the organization of the Construction Division, planned by the splendid men on the Committe just referred to, these 16 camps, and 16 other camps accommodating another 640,000 men of the National Guard troops, were all ready to take troops, as ordered, by Sept. 1, 1917—some of them within less than two months after they were begun.

This record of accomplishment was not approached by that of any other organization in the army. If the camps had cost four times as much, they would have been cheap under the circumstances. Nevertheless, certain men, apparently for political purposes, are now compelling the contractors who built those camps to defend suits, which, even if they are never tried, will greatly impair the reputation and business credit of every one of these able and patriotic Americans and will cost each of them many thousands of dollars

for the legal expense required to prepare to defend the suits. But worse than that, indictments charging criminal conspiracy, treason and other heinous crimes, have been brought against six of the most prominent, efficient and patriotic of all of the individuals to whom credit for the accomplishments of the Construction Division is due.

Many months have elapsed since the cunningly worded charges against the contractors and the indicted individuals were given the widest possible publicity through the daily papers of the country, and yet, five years after the war, the Attorney General is asking for more time for preparation of the cases, and has, up to date, failed to furnish any one of the bills of particulars ordered by the Courts.

Meantime, all of the men sued or indicted, stand pilloried before their countrymen, without having been given any opportunity to clear their names.

No one having competent knowledge of the facts, can consider these suits and these hideous indictments, brought in the name of our Government, by men who can not be sued for their official acts, and the subsequent delay in giving the accused persons an opportunity to defend themselves, as less than outrageous.

The foregoing matter is from a paper by Mr. Maury before the recent annual meeting of the American Water Works Association.

STREET LIGHTING FOR THE SMALL CITY

By G. B. McNair, District Illuminating Engineer, Westinghouse Electric Mfg. Co.

Most of us can remember when we used the carbon lamp for lighting our houses. But who would be content with the carbon lamp now? In the same way we are becoming more and more accustomed to high illumination values on the street and we require more light to see quickly. The rapidly moving automobile makes it necessary that we see quickly or accidents results.

Retail merchants are alive to the necessity of bright, attractive show windows because people stop before such windows. In the same way, it has been found that trade follows the bright lights of streets. People prefer to go along well lighted streets and business locations on such streets are more desirable and bring higher rents.

Accidents form a very potent reason for adequate street lighting. A very careful investigation by Mr. Ward Harrison, of the National Lamp Works, showed that 17 per cent of all the street accidents are directly due to insufficient illumination. In this investigation, proper allowance was made for every other contributing cause, and still one accident out of every six could be charged directly to insufficient light.

Crime has always gone hand in hand with darkness. The worst deeds are usually committed under cover of darkness. This is so commonly known that "daylight robberies" are given a great deal more space in newspapers than the same crimes committed under cover of darkness.

It was found that in Cleveland, Ohio, crime actually decreased 8 per cent. in the brightly lighted area while elsewhere there was an increase of 54 per cent.

In Chicago an attempt was made to save money during the coal shortage, by turning off the street lights. Immediately the number of hold-ups increased so alarmingly that it was absolutely necessary to turn the lights on to save the people.

In smaller cities there is often a very vague idea of what is necessary to provide adequate light for different parts of the city. The citizens often have the idea that the cost is so high as to be not worth considering. Actually, such lighting pays for itself in a short time in increased business and the cost is quite moderate.

Suppose that one hundred people walk along a certain block in a certain time. About four of these are down town to buy definite things. If the merchants on a street, by means of good street lights, bring to their doors half of the other ninety-six, they have done more than most other forms of advertising will do, and who does not believe in advertising, these days?

Having agreed that better lighting is necessary, the next question is "How shall it be paid for?"

If at all possible it should be put in as a municipal improvement and paid for by the city, because the city as a whole benefits, but if this can not be done because of lacks of funds, the next best way is to create an improvement district and assess the cost against the property frontage. This is done by initiating a petition and securing signatures for 51

per cent of the property frontage. This is presented to the Council, who will then pass an ordinance creating the district and directing the City Engineer to prepare specifications and take bids or otherwise provide for one purchase according to law.

Sometimes the Central Station has attempted to make individual contracts with the property owners. This almost always turns out badly as some property will be sold and the new owner will not continue the contract.

If the street is to be paved a strenuous effort should be made to get the city to buy cable and put it in ahead of the paving. This will save the heavy expense of trenching in the concrete at some later date and thus remove one great obstacle in the way of purchasing ornamental standards, namely, the cost of this trenching.

Every city that has put in ornamental lighting has found that the advantages so far out-weigh the value of the money expended that it could not be persuaded to go back to the old dark streets.

The commercial advantages are felt within a year, and the comfort in walking and driving, the first night the lights are turned on.

Just as the carbon lamp has been superseded by the gas-filled Mazda lamp, so the "bug lights," high up on poles about a block apart, will be finally replaced by ornamental posts close enough together to give real illumination adequate for all purposes.

FEATURES OF PLAIN MACADAM ROAD CONSTRUCTION

By William G. Tonkel, Road Superintendent, Allen County, Ft. Wayne, Ind.

I find that with very few exceptions the specifications on macadam roads today are the same as they were 10 years ago and I think this should be remedied at once, for 10 years ago we knew very little of the 5-ton truck carrying about 10 tons of weight. The specifications consisted of about 6 or 8 ins. of base material rolled down, on top of which 2 or 3 ins. of screenings was thrown, as a filler, and the result today is that when heavy loads pass over this kind of a road they tear through, the road gives way, and holes and chucks appear in a very short time, which of course necessitates quite a lot of maintenance.

In the construction of a good, plain macadam road I would suggest the following specifications: First of all 100 per cent drainage. Next a 12 in. base of large stone, consisting of about 8 ins. of stone ranging from 4½ to 2½ ins. in size, on top of which a thin coating of screenings should be placed and then rolled down.

On top of this a second course of stone ranging from 2½ to 1½ ins. in size, 4 ins. thick, on top of which a 3 in. layer of coarse screenings grading ¾ in. to dust should be spread and rolled down so that the voids in the coarse stone would be entirely filled.

A very important factor in a successful plain macadam road is the rolling. By attaching a sprinkler arrangement along with the roller and rolling a road, not once, but 25 times from end to end, you are bound to create a solid mass of metal.

A fault I find with the present day method on the plain macadam construction is the fact that the contractor wants to put down a base of so many inches of coarse stone and then put on about 5 or 6 ins. of screenings, thus making the required depth as per specifications. This, I think, is a very serious fault, for screenings are not supposed to be a wearing surface but are supposed to be a filler for the voids so that each large stone will be keyed in place and in time cement itself together into a solid piece of metal.

No doubt the contractor would much rather put on a thick coating of screenings because it handles much easier, rolls much easier, and immediately upon completion of his job he calls the county commissioners, the surveyor and superintendent on the road and shows them a very smooth job, but this only holds for a little time and soon the screening coat starts to pit up in small holes and buckle in waves, but after his job is accepted he does not seem to care. Why not put on a coarse screening of about 3 ins. in thickness and roll this down so that a smooth surface will result and at the same time your wearing material (that being the coarse aggregate) will be close to the surface?

Another thing that should be done is to put on an inch or inch and a half coating of limestone chips grading from ¾ to ¼ in. free from dust on top of all this. This would serve as a guarantee to the wearing surface.

After a macadam road of this type has been constructed and has served the community for a number of years, and in the course of progress this road graduates from the feeder type to a main artery of

commerce I can see no reason why this solid road bed should be torn up and thrown away for I think that what is known as an umbrella-type of construction (by this I mean a top of some bituminous material on top of this solid base) would change this plain macadam road into a pavement type of construction which is resilient and adapts itself to climatic conditions.

I know this to be very successful, for in Allen County we had this very experience. The Maysville Road, leading out of Fort Wayne in a northeasterly direction, is at present the main artery of travel for all Detroit and Toledo traffic. A portion of this road was constructed in 1914 at a cost of about $9,000 per mile. Aside from a miscellaneous maintenance expense it cost practically nothing to repair until in 1922. We decided to resurface this road according to the bituminous penetration method, the cost of which did not exceed $6,000 per mile, and today we have one of the smoothest pavements on this road that can be found in Allen County. Therefore, the original construction cost as well as the maintenance cost since 1914 has been about $15,000 per mile and a feeling of satisfaction and contentment exists in this community with all who have occasion to use this highway.

Therefore I feel that as every feeder highway graduates into a main artery of transportation that instead of tearing up the old road-bed and throwing away the initial cost of construction that with a few added dollars spent along this line you can give the community a paved road second to none.

Of course it is necessary to maintain and keep up this type of construction, but I know of no highway that is permanent and free from maintenance except it be the ocean, the great lakes and our navigable streams.

The foregoing matter is from an address presented at the recent Road School at Purdue University.

A STUDY OF TRAFFIC ACCIDENTS ON IOWA HIGHWAYS

(Editor's Note: The following facts and figures on traffic accidents on Iowa highways are reproduced from the Service Bulletin of the Iowa State Highway Commission.)

Deaths on the Iowa highways in accidents of various kinds during 1922 total 330. Sixty-six of these 330 deaths occurred in railroad crossing accidents. The balance of 264 occurred in accidents on the other portions of the highways.

There was a total of 6,513 accidents recorded in the clippings from Iowa newspapers which came into the Highway Commission office during the year. In these 6,513 accidents recorded there were, in addition to the fatal accidents, 7,281 persons whose injuries might be classed as serious, with either broken bones or badly cut and bruised.

In the past seven years in which these accidents have been recorded, from the same sources, there has been a total of 1,878 deaths. Of this number, 442 occurred on railroad crossings with 1,436 on other portions of the highways. There have further been recorded 27,754 accidents of all kinds with a total of 28,000 seriously hurt.

While the reports from which these accident tabulations are made are not official in any respect, it is believed that they are correct in regard to the number of fatalities. There is perhaps no accident in which the injured persons die within a few weeks' time of the accident, which is not recorded in some one of the daily or weekly papers of the State. It might happen that in case a person injured should linger for months before the death occurred that the cause of the death would not be ascribed to the accident in which the injuries were received. From a somewhat comprehensive study of the accuracy of these accidents over a period of several years, it is believed that absolute reliance may be placed upon the portions of the summary covering fatalities. So far as accuracy is concerned in the report of other accidents it is likely that the figures are entirely too small. There are many serious accidents which are never reported in any of the Iowa newspapers. Further, from the careful manner in which the Iowa papers are scrutinized daily by trained experts in the clipping bureau which supplies these clippings, it is not believed that any appreciable percentage of accidents of any kind escape the attention of the clippers.

It is interesting to note in the monthly tabulation for the year 1922, which accompanies this article, the relative proportion of the accidents in the various months. Reference to the monthly tabulations for several years back indicate that the same relative proportions are carried out from year to year. April has almost invariably been the lightest month for accidents. In 1922 there were 10 fatalities

in this month. February and March usually have a few more. In 1922 there were 15 in each month. From April the increase is steady through May, June and July. August, September and October are invariably the heavy months. In 1922 there were 42 fatalities in August, 47 in September and the same in October. From this time on the drop is steady until the low point period is reached in April with this record of 10 in 1922.

Noting the tabulation of deaths on railroad crossings, September and October were the high months in 1922, the total number of deaths being 18 and 22 respectively. There were three months—March, April and June—in which no crossing accidents causing deaths were recorded. In 1922 there were 30 fatalities less on the railroad crossings than in 1921. It is possible that this reduction of the number of accidents may have been due in part to the extensive campaign which has been carried on during the past year against careless and reckless driving on the highways and the special campaigns for the reduction of grade crossing accidents through the exercise of greater care on the part of automobile drivers.

Head-on collisions on the open highway are the most prolific source of road accidents. In 1922 there were 1,693 accidents recorded in the daily papers; 1,236 persons were badly cut and bruised and 337 people recorded with broken bones.

The next most prolific source of accidents was in the tabulation of people struck by automobiles. Of these, there were 1,105 accidents, in which it was recorded that 1,044 of the persons struck were seriously hurt.

The third most prolific source of accidents is contained under the classification of automobiles over embankments. Under this classification is listed any type of accident in which the car leaves the highway and goes over into the side ditch. This does not necessarily imply that the accident occurred on the highway where there is a high grade or a deep ditch. There were 653 accidents of this type with 664 people badly cut and bruised and 210 with broken bones.

Accidents in which automobiles turned turtle, which is the common term for cars upsetting, either turning completely or partially over, total 588 with 962 people badly hurt and 249 with broken bones. It is interesting to note that this type of accident results in more injuries on the average per accident than under several of the other classifications.

Two hundred forty-five automobiles were struck by trains in railroad crossing accidents with 284 people injured.

In the other type of accident in which the train is struck by the automobile, there were 32 recorded with 38 people hurt.

One hundred eighty-eight buggies were struck by automobile with 264 people injured.

Car skidding is scheduled as responsible for 257 accidents and accidents due to the breaking of some part of the car comprise a total of 299. Glaring headlights on automobile were given as responsible for 92 accidents and 65 accidents were due to intoxicated drivers; 64 automobiles plunged over or through bridge railings into the stream bed below.

Careless and reckless driving would seem to be the cause of perhaps 90 per cent of all the accidents on the highways. It is very seldom indeed that the design, construction or maintenance of the highway is responsible for accidents. As the summary indicates, a very small percentage of accidents are due to car breakage or weather conditions. Car skidding, for instance, would seem to be a prolific case, was responsible for only 257 acci-

ACCIDENTS AND FATALITIES ON THE IOWA HIGHWAYS DURING YEAR 1922

Month	Total Deaths	On Highways	On R.R. Crossings	Total Accidents	Total Hurt
January	23	17	6	313	309
February	15	13	2	269	293
March	15	15	0	223	237
April	10	10	0	252	279
May	19	18	1	389	475
June	25	25	0	547	496
July	34	25	9	518	455
August	42	37	5	868	978
September	47	29	18	820	1,009
October	47	30	17	1,006	1,268
November	28	23	5	628	708
December	25	22	3	680	774
Total	330	264	66	6,513	7,281

ACCIDENTS AND FATALITIES ON IOWA HIGHWAYS FOR PAST SEVEN YEARS

Year	Total Deaths	On Highways	On R.R. Crossings	Total Accidents	Total Hurt
1916	199	146	53	2,574	2,834
1917	281	219	62	5,100	5,208
1918	237	175	62	3,027	3,450
1919	203	153	50	2,809	2,708
1920	269	216	53	3,048	3,124
1921	359	263	96	4,683	4,195
1922	330	264	66	6,513	7,281
Total 7 yrs.	1,878	1,436	442	27,754	28,800

ACCIDENTS IN WHICH NO FATALITIES OCCURRED IN 1922 ON IOWA HIGHWAYS

		Persons Injured
653	Autos over embankment—	
	Persons with broken bones	210
	Persons cut and bruised	664
588	Autos turned turtle—	
	Persons with broken bones	249
	Persons cut and bruised	962
1,693	Autos in collision—	
	Persons with broken bones	337
	Persons cut and bruised	1,236
188	Autos collide with buggies	264
60	Autos collide with motorcycles	68
148	Autos collide with street cars	144
88	Autos collide with bicycles	80
281	Autos into obstruction in road	320
1,105	People struck by autos	1,044
245	Autos struck by trains	284
32	Trains struck by autos	38
252	Accidents with horse vehicles	268
43	Autos causing runaways	49
299	Accidents due to car breakage	436
257	Accidents due to car skidding	282
92	Accidents due to glaring headlights	160
65	Accidents due to driver being intoxicated	89
334	Accidents where autos were damaged and no one hurt	0
64	Autos plunge into creek over bridge	71
26	Coaster accidents	26
	Total accidents	6,513
	Total number of people injured	7,281

dents, while autos in collision in which the fault it would seem, in 99 out of 100 cases, would be with the drivers, totaled 1,693.

As stated many times in the Service Bulletin, safety on the Iowa highways as they are now designed, constructed and maintained is a matter of safe driving or of having reasonably careful drivers in charge of the cars on the highways. Put the unsafe driver off the highway and a very large percentage of the accidents occurring on the highways would be eliminated at once.

That the fault is almost entirely due to the driver and not to the highway or the car is amply evidenced by the fact that the large percentage of serious accidents as reported, not only in Iowa but in other states as well, take place not at what might be considered danger points on the highways but on the best improved straight-away stretches, and on perfectly smooth hard surfaced roads. The inference is that speeding beyond rational limits, the condition of the road surface and the traffic present on the road considered, is perhaps the one greatest single cause of highway accidents.

NOTES ON CITY PLANNING AND ZONING

(Editor's Note: The following concise summary of the advantages of city planning and zoning, in cities of all sizes, is from a report of a committee of the League of Minnesota Municipalities as presented at the recent convention at Faribault. The committee was composed of N. N. Bergheim of Little Falls, D. J. Chatham, Faribault and George H. Herold (chairman) of St. Paul. It is expected that a law making possible city planning and zoning in Minnesota will be passed at the next session of the legislature of that State).

It is only within the last few years that city planning has been recognized as a legitimate municipal function. This tardy recognition is due largely to the fact that early planning dealt almost altogether with specialized features, civic centers, group plans and other costly projects; the first published reports were overburdened with projects impossible of accomplishment, and magazine writers overplayed the "City Beautiful" idea until the whole subject fell into disrepute. In the meantime less spectacular workers were obtaining evidence which proved that the ills of a town were due more to its deformed and unguided growth than to forms of government, personnel of councils and charters or ordinances.

A study of the layout of any town brings out the fact that the original town site plat prepared by the proprietor of the land becomes the framework or plan of the future town. The streets were laid down on this plat for the purpose of bounding lots and if corner lots were in demand cross streets were put in to create them. Little or no thought was given to the streets as a means of transportation. The law requires that platted property must have means of access and the proprietor complies with the law and no more, so that the street system of any town or city is simply what the proprietor of the original town site saw fit to give for public use, and here, therefore, is the starting point, where may be found the germs that in future years brings to so many towns of promise the "sleeping sickness," "paralysis" and "deformity," and a costly surgical operation is the only cure.

Town planning is simply sound economics; every town must have its utilities, sanitary requirements, convenience and service and the cost of these are the

cost of town living. Streets graded, paved and guttered; sewers; water mains; fire protection; gas mains; telephone lines; electric distribution lines; steam heat; power lines; transportation; lighting service; parks; boulevards and playgrounds are all component parts of the town and are designed for certain conditions. If these conditions are guessed at, then the public's money is wasted through constructing larger or stronger and more extensive units than are needed or through constructing smaller units than will be required and then rebuilding them. Every public utility, private or municipal, that can forecast its probable demand of service accurately can furnish that service at the least cost. A zoning ordinance makes an accurate forecast possible.

Furthermore, when commerce brings together an aggregation of people to form a town they, in order to live together harmoniously, elect a set of officers to umpire the game. There is no state constitution that gives to any City Council any power other than that of an umpire.

The officials of every town should do what is possible to insure the purchase of a home as a good investment, for the purchase of a home is the one big investment of a large majority and it should be protected against every kind of value destroying encroachment. You cannot go to a town of any size but what you will find blighted districts where homes have been turned into boarding houses, tea rooms or are vacant, the original value of the district having been destroyed by the building of a store, laundry and the like, in close proximity, thus causing a migration of the home district. There being no compensating use for these homes the original owners lose their value and the town loses in taxes. Residence districts should not be permitted to deteriorate in this way; old homes are more valuable than new ones if kept in repair, and renewal and repairs would be made for years if the district was protected against non-conforming uses. Homes should be worth more after twenty years than the day they were built, and when a man buys a home he should feel assured that he can leave this home to his children with all its value intact, or increased in value by the labor, thought and development that he put in it through the years.

The city or town plan well executed is a big problem requiring the best effort of the most forward-looking citizens for one part of the plan exercises an influence over other parts. Land should not be set aside for parks that foresight and possible knowledge shows, should in time become residential or business property. The most delightful parks are those which have been created out of swamp, low-lying or broken land unsuitable because of topography for any other use. Arterial highways should be laid down in the town plan and all their features worked out in detail so that platting and connecting cross streets may work in with it. When a railroad company builds its grade the line is laid down to fit the topography so that material taken out of cuts will exactly fill the low places and bring the roadbed to grade. A municipality grades its streets piece-meal; if there is an excess of dirt the contractor wastes it or sells it and then when the part of the street is graded, that requires a fill, the earth must be bought and hauled from a long distance. This is just one of the costs of living in a town that is unnecessarily great because of the lack of planning. Arterial streets should not have too many intersecting streets. Every cross street presents a problem in safety. Blocks along an artery should be at least one-quarter of a mile long; foot paths 10 or 12 ft. wide may be provided intermediately.

The committee desires to call attention to the possibility of an entirely different development plan for small towns than the present system. It would be based on traffic necessities and community needs. A Town Planning Board regulating platting and a zoning ordinance regulating the use of property are needs of every community within the State.

A City Plan would improve traffic conditions, lower the cost of transportation and distribution of commodities, increase business, safeguard residential areas, rehabilitate blighted districts, stabilize property values, create high-class retail districts, place factories and warehouses in desirable locations where they may thrive without protest from residential owners, create ample recreational areas and do this in a scientific manner.

PENNSYLVANIA NOW HAS MOTOR VEHICLE CERTIFICATE OF TITLE LAW

After Nov. 24, 1923, it will be illegal in Pennsylvania to own or operate a

motor car without a certificate of title, the Department of Highways recently announced. It will not be possible to secure 1924 license tags until a certificate of title for the automobile has been recorded with the Department of Highways.

The title law, signed by Governor Pinchot May 24, 1923, provides that every motor vehicle, whether passenger or commercial, every motorcycle and motor bicycle in Pennsylvania must be titled prior to Nov. 25, 1923. In other words, owners of such vehicles must possess a legal title, somewhat similar to the title for real estate.

Within a short while the Department of Highways will mail specific notice to all owners, together with an application for a certificate of title. These owners will also receive a copy of the title law and information telling them the exact location of the engine and manufacturer's numbers on their cars. Special stress will be placed on these numbers. If the numbers shown on the application for certificate of title are inconsistent with the year shown on the application—or should the number of any particular part of the motor or vehicle be listed instead of the engine or manufacturer's number, the application will be returned for correction. Under the title law the engine number file will be the predominating file. The duplications of engine or manufacturer's numbers will be carefully checked and titles will be cancelled when carelessness is shown in setting forth these numbers.

Although the new law will not prevent the stealing of motor vehicles, it will, Secretary Paul D. Wright declares, prevent the sale of stolen motor vehicles in Pennsylvania. Other states have found it an admirable check on stolen cars. No car may be transferred in any way unless there is a clear title for it.

An illustration of the operation of the title law is as follows: A manufacturer delivers a new car to a dealer. The dealer immediately makes application for a certificate of title on a blank especially prepared for his use (in case of new car) and receives from the Department certificate of title for this car at a fee of 50 cts. The dealer then sells the car to a purchaser and assigns title to the purchaser by endorsing the assignment on the reverse side of the certificate of title. The purchaser, to secure a certificate of title, merely answers a few questions on the assigned title, signs his name in the space provided and forwards it to the Department with a fee of $2, at which time the Department issues a new certificate of title to him and retains the assigned title. Pennsylvania has gone a step further than other states by allowing purchasers of cars to apply for certificate of title and license tags on the same blank under one notarial seal. Should the purchaser subsequently desire to sell or trade his car, he follows the procedure outlined above. One car receives but one title number and transfers from time to time are designated by letters A, B, C, D, etc., preceding the title number. This is another step in advance of the majority of states. Maryland issues a new certificate of title each time the same car changes hands. For example, should Ford car No. 500 change hands five times in one year it would probably receive the following title numbers in Maryland: 1, 2550, 55098, 101022 and 205000. To check title on this car, five records would be traced. In Pennsylvania, should Ford car No. 500 receive title No. 1, subsequent titles would be numbered A-1, B-1, C-1 and D-1, the record being kept intact in one file. This serves as an immediate check and eliminates endless research and filing work.

Certificate of title is good for the life of the car, so long as the car is owned by the original owner of such certificate or held by the original owner of such certificate of title, and need not be renewed annually. Application for certificate of title shows the kind of encumbrance or lien, the date, the amount and in whose favor it is drawn. When the certificate of title is issued, the amount of the encumbrance, as well as in whose favor it is drawn, are listed thereon. Any person purchasing or acquiring a motor vehicle with a lien or encumbrance thereon does so at his own risk. He should examine the title that is being assigned to him before accepting the motor vehicle. Encumbrances will be removed from the certificate of title when it is satisfactorily proven to the Department that they have been paid and all purchasers of motor vehicles are urged to examine the title and exercise the same caution as they do when they procure a piece of real estate property.

CIVIC CO-OPERATION AT STEVENS POINT, WISCONSIN

By Morgan Chase, Secretary-Manager, Chamber of Commerce, Stevens Point, Wis.

It is highly important that a complete understanding be effected early in the mixed associations of the officials of any city and its Chamber of Commerce. Understanding is the base upon which men must deal with each other. Without this confusion turns worthy efforts into failure and good men into first class enemies.

Understanding is not reached under the strain of Domination. One must gain it through the use of careful planning and much patience, and through proper knowledge of human nature.

I am not one who believes that politics makes honest men dishonest. Neither does business. Nor any other pursuit I can name. It is a mighty safe bet, then, that the average city official is just as honest and tries to do his duty just as hard as the average chamber of commerce member or official.

With such belief it is not the most difficult thing in the world for the City government and the Chamber of Commerce of Stevens Point to live in peace. Though we may sometimes disagree, we do not become disagreeable about it.

The Chamber of Commerce is a minority organization and for that important reason it cannot hope to accomplish a single worthy object unles it can do so by persuasion. And if it can accomplish much well may it be said that the objectives to which it has worked have been right and that its methods have been respected.

We in the Stevens Point Chamber of Commerce believe that wherever possible it is mighty good business to take the city officials into our confidence at the outset. After our idea is well incubated and nursed into healthy being we approach our friends, the Council members, and our Mayor and lay it "unofficially" on the table. And then we let them think of it and amend it and finally look upon it as their own. True, sometimes, it is not acceptable at all.

But after all is any man or group of men able to turn out and execute an undiminishing stream of one hundred per cent ideas? Do we turn on the official family and complain because a certain idea of ours upon which we had probably been working for a year or more was not brought into being? By all means we do not. And if the idea strikes the official family right and it comes before them in a formal manner and is passed and becomes an ordinance we record it as a joint effort which brought good results and set it down in this way on our yearly report: "Assisted the mayor and council in accomplishing the arterial highway system," or whatever the job might be.

It is pertinent that the secretary of a Chamber of Commerce remember that if he develops an antagonistic attitude toward the officials of his city in any of his spoken or printed words that they will develop a like attitude toward him, a purely human thing to do. They have it in their power to hamper greatly the work of the chamber secretary if they believe him to be merely a self advertiser, who can't play the game square.

The matter of credit for completed work bothers many chambers of commerce and their secretaries to the extent that they are apt to make inroads on that which accrues either in whole or in part to members of the city administration. And on the question of credit have many such organizations gone to their Waterloo.

There is enough credit to go around, and there are hundreds of things which are entirely and purely the work of community organizations for which ample credit will follow satisfactory execution. When that is realized another step will be taken toward real helpfulness. When we take a measure before our mayor and aldermen we know we must convince them of the merit of our case. We work on that principle only and do not ask support as a personal favor. Another thing—before we take up a piece of work we know through referendum to our membership that our stand meets with the majority mind.

Perhaps better working partnership could be brought into being between other city administrations and their chambers of commerce if both would realize just what the latter is created to do. In a few words it's one big reason for living "to make the public think in civic terms;" to focus thought; to provide a place where citizens at large, without respect to membership alone, may find common ground on which to propagate the seeds of civic pride and on which to create the center of unofficial civic activity.

The foregoing is from an address by Mr. Chase before the League of Wisconsin Municipalities.

Construction News and Equipment

TEN THOUSAND MILES OF NEW ROADS IN THE SOUTH

Over 10,000 miles of roads were completed or placed in an advanced stage of construction in sixteen southern states during 1922, at a cost in excess of $165,000,000.

Bonds for good road development during the year reached a total of $132,199,615, and since much of the expenditure for new roads comes from state taxable sources and from federal aid, it can readily be seen that $200,000,000 is more nearly correct.

One of the most important developments in recent southern road building is the large amount of hard surfaced roads being laid. Until two or three years ago, unbound macadam was the only hard road laid out, today, 20 to 50 per cent of all state highways being built are hard surface. The time is very near at hand when the northern and eastern tourist can make his Florida trip over perfect roads every mile of his journey.

Taken with the federal aid appropriations for the period 1921-1925 and the new bond issue, North Carolina, for instance, has available the enormous sum of $120,000,000 with which to develop the network of highways that traverse the state.

Under the stimulus of what its neighbor is doing, South Carolina is now projecting a bond issue of $50,000,000 for road development. Sentiment has been widely crystallized and the probabilities are that the bond issue will be passed within another 12 months.

Georgia, while turning down an ambitious program of bonds to total $75,000,000 at the last meeting of the legislature, is awakening to the necessity of statewide action, and something definite in the way of a large bond issue for state highways will probably result at an early date.

Arkansas, Oklahoma and Texas are building rapidly and with permanence. In Arkansas and Oklahoma, the counties which have recently been enriched by the sudden wealth of oil development are investing large sums in hard surfaced roads, in the construction of huge bridges and in opening up additional areas to motor traffic. The vital need of automobile communication in the oil areas has spurred on the sections around Fort Smith, El Dorado, Muskogee, Tulsa and other points to ever-increasing development.

Texas, with its hundreds of miles of distances, during the past two years has laid down 1,667 miles of highway, and has 1,591 additional miles in various stages of completion. Of this total, 1,089 miles is hard surfaced. The estimated cost is in excess of $48,000,000. This does not take into consideration large projects financed by counties.

NATIONAL LIME ASSOCIATION ORGANIZED FOR EXTENSIVE RESEARCH WORK

The National Lime Association at its Annual Convention in June, has adopted a plan of organization which assures the continuation of its growing program of technical and research work and establishes a stability to the National organization which will make it possible to establish and follow through to conclusion problems of research for the general benefit of the industry.

The National officers and Board of Directors remain as the controlling body, directing the entire research and trade promotional program of the industry, but for the purpose of assuring a continued source of income for all departments of the Association and adding more flexibility to the local field promotional work, the program has been divided into two separate departments; first, the national program of technical research, publicity and national promotion; second, local trade promotional work by men in the field, sub-divided and directed from two division offices with headquarters located at Washington and Chicago.

The members of the Association have agreed on a basis of dues for a period of two years, which will afford the Na-

tional program of technical research work a larger working budget than has been heretofore available, and the members in both the Eastern Division and the Central Division have agreed on a basis of additional dues which allows for a considerable increase in local field promotional work in the two Divisions.

The Lime Association loses the able leadership of Mr. Charles Warner, who has served as its President for the last four years, and who has been primarily responsible for bringing the work of the National Association to its present high standard.

The new President, Mr. George B. Wood, is President and General Manager of the Rockland and Rockport Lime Corporation, of Rockland, Maine. He is a technically trained engineer, having received his degree from the Massachusetts Institute of Technology, has been an active Director of the National Association, and has added much to the lime industry in the way of technical advancement. He is a most enthusiastic believer in the future growth of the lime industry as the result of technical research and development, and is happily chosen as a successor to Mr. Warner.

Mr. William R. Phillips, the former General Manager of the Lime Association, has resigned to take the position of Vice President and General Manager of the American Lime & Stone Company. The Headquarters office and organization is now working under the management of Mr. Burton A. Ford, Acting Secretary, who carries along the work well qualified by his experience during the last year as Mr. Phillips' assistant at the Washington office. Mr. Ford is a technically-trained man, receiving his degree from the University of Maryland. Prior to joining the Association staff he was a Division Manager of the Virginia-Carolina Chemical Company and Secretary-Treasurer of the Bryant Fertilizer Company.

Dr. M. E. Holmes has resigned from the technical staff of the Association, and Dr. G. J. Fink has been appointed Chemical Director. Dr. Fink is a graduate of Wabash College and was for six years instructor in Chemistry at Cornell University, where he received his Ph. D. degree in 1914. He was also Professor of Chemistry at Iowa State College, and for five years prior to coming to the Lime Association was Research Chemist for the Hooker Electrochemical Company. Dr. Fink has been with the Association staff for two years, and is well qualified to assume the direction of the chemical and research problems.

In addition to work at the Association Laboratory in Washington, the Lime Association is supporting at the present time, fellowships in five leading technical institutions where various special problems of investigation and research work are being carried through to conclusion. Co-operative relations also exist with other institutions where important research on lime problems is being conducted. The increased budget for this class of work will make possible, under the two-year program, the completion of the many problems on hand, and the inclusion of new important problems.

The personnel of the National Lime Association is as follows: President, George B. Wood, Rockland, Me.; Vice President, Fred Witmer, Woodville, O.; Treasurer, Milton McDermott, Knoxville, Tenn.; Board of Directors—A. N. Griffing, Danbury, Conn.; C. J. Curtin, New York, N. Y.; George LeGore, LeGore, Md.; O. J. Vanderpool, New York, N. Y.; Warner Moore, Richmond, Va.; J. J. Urschel, Toledo, O.; F. M. Pinnegar, Cleveland, O.; Morgan Curtis, Petoskey, Mich.; B. L. McNulty, Chicago, Ill.; Col. C. W. S. Cobb, St. Louis, Mo.; R. C. Brown, Oshkosh, Wis.; J. M. Gager, Chattanooga, Tenn.; J. F. Pollock, Kansas City, Mo., and H. Dittlinger, New Braunfels, Tex.

Headquarters Staff: Burton A. Ford, Acting Secretary; R. C. Towles, Office Manager; Dr. G. J. Fink, Chemical Director; W. A. Freret, Consulting Engineer; J. A. Slipher, Soil Technologist; R. P. Brown, Construction Engineer.

Eastern Division (Division Office, Washington, D. C.): Henry M. Camp, Division Manager; R. C. Parker, Agronomist; W. F. Campbell, Construction Engineer; W. F. Beyer, Construction Engineer, and W. D. Steward, Construction Engineer.

Central Division (Division Office, Chicago, Ill.): G. B. Arthur, Division Manager; L. B. Burt, Chemical Engineer; A. B. Giett, Construction Engineer; W. H. Magee, Construction Engineer; C. O. Dowdell, Construction Engineer; A. C. Hamilton, Jr., Construction Engineer; L. E. Johnson, Construction Engineer, and O. A. Wakeman, Construction Engineer.

ELECTRICAL APPARATUS FOR NEW SEATTLE SUBSTATION

With its Skagit River development well under way, the City of Seattle has begun the erection of a large substation, known as the North substation, to serve the receiving end in the city for the development. The new station will be located in the residential part of the city and is designed to harmonize with its surroundings.

There will eventually be installed in the substation a maximum of six banks of transformers with the necessary synchronous condensers and switching equipment. The ultimate installation will be fed from the Gorge plant on the Skagit River through two transmission lines approximately 100 miles in length, designed to transmit 90,000 kv-a., three-phase, 60-cycle current at a receiver voltage of 154,000 volts. The transformers feeding the lines at the generating station are rated at 165,000 volts and have permanently grounded neutrals.

The initial installation will include the equipment for one incoming transmission line at 154,000 volts, one transformer bank, and one 15,000 kv-a. synchronous condenser. An order for this apparatus has been placed with the Westinghouse Electric & Manufacturing Co. and it is now in course of construction. An electrostatic glow meter will be used for synchronizing on the 154,000 volt side. The stepdown transformer bank has three 10,000 kv-a. transformers with tertiary windings. Both the 154,000 and 26,000 volt lines are connected with permanently grounded neutrals. The 26,000 volt side is connected to a bus section on which there are three feeders. In the future, each transformer bank will have a 26,000 volt bus section, all the sections to be tied together through reactors. At the present time two sections with a total of six feeders will be tied together without reactors and will be fed from the one transformer bank.

The tertiary windings of the transformers are connected in delta at 6,300 volts and are connected to the 15,000 kv-a. synchronous condenser wound normally at 6,600 volts. Taps are brought out of the transformers for starting the condenser.

The high tension oil circuit breakers are Type G-2, 400 ampere, 154,000 volts; the 26,000 volt breakers are type CO-2, 1,200 amperes with mufflers; and the breakers for use with the 6,600 volt condenser are type CO-11, 1,600 amperes, 25,000 volts.

The auxiliary equipment consists of a 300 kv-a. transformer bank; a 100 K.W. motor generator set to be used for an extra exciter, for operating a crane, or for charging the storage battery in an emergency; a 7½-K.W. battery charging set, and a 60-cell storage battery for control purposes.

A type D-3 benchboard having a relay board in the rear with grill work at each end will be supplied. This desk will be used for controlling the condenser and the incoming line and is drilled for future apparatus for controlling the second line and the tie breaker between the two lines. A switchboard consisting of two switchboards mounted back to back with grill work between will be provided for controlling the 26,000 volt feeders and the voltage regulator equipment for the condenser.

There will also be a temperature indicating board for indicating the temperature of the coils in the condensers and the temperatures in the individual transformers; a station service board for controlling the storage battery, station light and power spare motor generator set, and other miscellaneous circuits; a field control board, and a crane panel. Differential protection will be provided for the condenser and for the entire transformer bank. The 154,000 volt incoming line will be protected with type CR relays and a ground relay.

TENNESSEE COUNTY DEVELOPS SUCCESSFUL TYPE OF ROAD

The highway department of Davidson County, Tennessee, where Nashville is the county seat, has developed an economical and successful type of road by salvaging with surface treatment, 215.8 miles of old gravel and waterbound macadam. These roads, according to J. G. Creveling, chairman of the Davidson County Highway Commission, comprise 26 per cent of the county system and carry 90 per cent of the traffic.

"We have been resurfacing our old macadam and gravel roads," says Mr. Creveling in a report to the Nashville Chamber of Commerce, "with a substantial thickness of waterbound macadam, being rather sparing in the use of fine

aggregates and rolling the coarse stone before adding the fines. After permitting travel to use the road until well compacted and the excess fines whipped off, we apply one-half gallon of heavy Mexican asphaltic road oil, which is immediately covered with a special crushed river gravel about 400 yards per mile of twenty foot width.

"We utilize every bit of value in our old roads and we build from start to finish without detouring travel. The cost is lower, we can make more progress and it stands up well under our travel which on certain roads, averages 2,000 vehicles per day. Roads built during 1916-1917 and on to date are still in fair condition without reoiling. Immediately after a road is completed it is placed in charge of a patrolman who gives it regular attention. One man with a mule and wagon takes care of about 20 miles of oiled road. This work costs about $150 per mile per year for labor and material used.

"As the surface treated road gets rough or wavy we find that it can be scarified, reshaped and reoiled at a nominal cost and by using one-fourth gallon, instead of one-half gallon as originally, it is really better than when first treated. We have reoiled less than 10 per cent thus far. We estimate on our main roads, which average from 800 to 2,000 vehicles per day near the city down to 200 near adjoining counties, that it costs less than one-half a cent per vehicle mile to build and maintain this type of road."

TWO REEL FILM SHOWING MANUFACTURE OF CEMENT NOW AVAILABLE.

Much of the unusual equipment involved in making cement is interestingly illustrated in a two reel moving picture called, "The Story of the Manufacture of Portland Cement," just released for general showing.

Starting with views of one of the large plants in which the country's cement is made, the film pictures in a non-technical way the essential steps in transforming thousands of tons of raw materials into Portland cement. Scenes taken at a number of plants are included.

From the moment that a great blast breaks loose a cliff of limestone in the quarry to the time when the finished cement goes into storage in big concrete bins, the process of manufacture is almost entirely mechanical—otherwise present day outputs would be impossible.

In addition to straight photography, animated drawings have been inserted to make clear what occurs inside the grinding mills, what goes on within the white-hot interior of the huge kilns, and how the cement sacks, suspended upside down, are filled after they have been tied.

This film can now be secured without charge by interested organization through any office of the Portland Cement Association, or from Association headquarters at 111 W. Washington St., Chicago.

EVINRUDE HIGH PRESSURE PUMP IS ADOPTED FOR FIRE FIGHTING IN SANTO DOMINGO

The city of Santo Domingo, in the West Indies, whose 20,000 inhabitants have heretofore been entirely without fire protection, has decided to purchase an Evinrude high pressure pump after a successful demonstration of its efficiency before a group of the city's leading men including the Mayor, the Chief of Police, the President of the Chamber of Commerce and the Governor of the Province of Santo Domingo.

There being no aqueduct or other source of water supply apart from rain water cisterns, a regular fire department is out of the question in Santo Domingo. However, it is thought by placing three or four Evinrude high pressure pumps at various points of vantage throughout the city, it will be possible to combat disastrous fires of which there have been several during the past few months.

This pump is powered by an Evinrude two cylinder 2 cycle 4-5 H. P. gasoline engine with the Evinrude built-in-flywheel magneto, gravity feed carburetor and easy starting device. This engine is direct connected to a Viking 1½-in. special type high pressure pump. Both are compactly mounted on a strong aluminum base, the total weight being only 99½ lbs. It is especially designed for use in industrial plants, small towns and isolated institutions and for fighting forest fires and general fire service in lumber yards. Although designed to pump against 120 lbs. pressure, in demonstrations it has greatly exceeded its rated capacity, the pressure gauge showing an average of 150 lbs. and at times reaching the high pressure of 180 lbs. per square inch.

With ¼-in. nozzle this pumping outfit

has thrown an 80 ft. stream with a pressure of 170 lbs. In another test the pump was stationed 175 ft. above the water level and through 1,500 ft. of 1½-in. hose and with ¼-in. nozzle it threw a 50 ft. stream with a pressure of 140 to 160 lbs.

SPECIAL TRAFFIC STUDY IN DETROIT

The special traffic conditions of the northern part of Detroit, centering in Highland Park, the site of the Ford motor works, are being studied by J. Rowland Bibbins, Consulting Engineer on Transportation, 921 Fifteenth St., N. W., Washington, D. C. This situation has been growing in complexity along with the City itself, due to lack of adequate development of streets, transit lines, terminals, etc., combined with the rising flood of motor traffic, buses and de luxe jitneys.

The Ford motor works employed 14,000 men in 1914, 31,000 in 1916 and employs 70,000 today, with practically the same street car lines and terminals existing today as in the pre-war period.

In ten years, with the development of the Ford industry, the population of this district has increased 1,000 per cent, with 60,000 people now housed in less than three square miles of area.

Perhaps nowhere in the United States is a city confronted with the problem of transportation facilities for 70,000 workmen in one factory with 33,000 on one shift, and with a single main thoroughfare conveying cars at 20-in. headway, motors at 2-in. and pedestrians at 0.2-in. headway.

Thus the Highland Park District has grown to be the traffic key of the City on the north. Mr. Bibbins will embody in his report to the city council a broad consideration of streets, railroads, interurban development and special transit terminals as well as specific recommendation for immediate remedies in traffic control. In this work, the co-operation of various officials and traffic agencies of Detroit has been enlisted, as the problem is viewed as more regional than local.

BLACK PAINT FOR TRAFFIC MARKS

The paint department of the Du Pont Company announces the development of a traffic black for marking purposes in the regulation of traffic. This is in addition to the traffic white, which is already being manufactured. The new black is the result of co-operative experiments with a number of cities, and has been developed to meet the needs of cities and counties which are using this color for traffic control.

The new paint dries dust free in 15 minutes, tack free in 30 minutes, and in from 5 to 6 hours dries to a hard, elastic film. After being in daily use for 10 weeks, it still retained its durability and color, and was in every way satisfactory.

VALUABLE TRADE LITERATURE

(Copies of this literature may be obtained by writing to the addresses given in the reviews or to this magazine.)

Electric Lighting Equipment—The Westinghouse Electric & Manufacturing Company has issued two new catalogues on electric lighting equipment: Catalogue 8-A on Overhead Street Lighting Equipment and Catalogue 8-B on Ornamental Street Lighting. The first catalogue contains 72 pages and the second 68, and both are fully illustrated with photographs and line drawings. In addition to the lighting equipment itself, the catalogues contain a complete descriptive list of accessories such as cables, potheads, mast arms, cut-out pulleys, etc.

Swimming Pool Sanitation—A bulletin of 16, 8½x11-in. pages has been issued by the Graver Corporation of East Chicago, Ind., on the Graver recirculating and refiltering system for maintaining a hygienic water in swimming pools. Information is given for designers of pools.

Truck Cranes—The many time and money-saving uses of the Byers Truckrane are illustrated and described in a bulletin of 16, 8½x11-in. pages just issued by the Byers Machine Co. of Ravenna, Ohio. This Truckrane is an industrial crane designed to be mounted permanently on a motor truck chassis. The bulletin tells just what it is, how it operates, and gives all the data requisite to a complete understanding of this piece of equipment and its uses.

Pumps—A new style of centrifugal pump, called a "series pump," is described in a catalog just issued by the De Laval Steam Turbine Co., Trenton, N. J. In this pump, double suction im-

pellers and volute diffusers are used, as in single stage centrifugal pumps. The connecting passages from stage to stage, however, are included in the pump case casting, as in the ordinary multistage pump. The advantages claimed are perfect hydraulic axial balance and high efficiency under varying loads, as is characteristic of the single stage pump. These series pumps are made with two or three stages. Where more than three stages are required, the use of two independent pumps operating in series and mounted on a single base plate is recommended in order to keep down the length of shaft between bearings.

Steel Joist Construction—The use of Steel Joist Construction in light-occupancy buildings has made rapid advances recently. Its fireproofness, economy and simplicity are not generally recognized; hence the demand by architects, engineers, contractors and builders for accurate data on design and construction. The Truscon Steel Joist Data Book, as its name implies, is a handbook of information. It presents in concise, convenient form the essentials, tables for designing, specifications and details, so that the man who has the book can lay out and design a complete steel joist installation. The book is issued by the Truscon Steel Co., Youngstown, Ohio. This Data Book is profusely illustrated so that photographs and drawings practically tell the whole story. Tables of carrying capacities and properties are set in large bold type so that they are easily read and are conveniently arranged for use. The front part of the book is devoted to a description of the essential features and to a photo gallery of 32 views of different installations. The field covers apartments, residences, schools, public buildings, hotels, hospitals, stores, offices, clubs, university buildings, theaters, factories and garages. Following these are the sections of properties of the different types of joists, Hy-Rib and channels. The safe loading tables give the carrying capacities and individual beams and for the floor itself with various joist spacings. Useful information on weight of floors, bending moments and deflection of beams for various methods of loading and co-efficients for deflection, follow. Specifications for Steel Joists are comprehensive. Isometric drawings of floor and partition details are given. The various accessories used with Steel Joists, such as joist clips, screed clips, hook staples, etc., are shown in application. The remainder of the book is devoted to details covering the use with structural steel, masonry walls and reinforced concrete; also details of framing around openings, installation of pipes and conduits, suspended ceilings, balconies, grandstands, roofs and stairways. On the last page is a typical floor plan with details of the use of joists for first floors of residences.

Bates Experimental Road Tests—"The Story of the Traffic Tests on the Bates Experimental Road as Told by the Camera," is the title of a pamphlet of 16, 9x12-in. pages issued by the Portland Cement Association, 111 W. Washington St., Chicago. The bulletin places at the disposal of engineers and officials the facts and conclusions obtained from the Bates Road Tests. In addition to numerous pictures it contains a description of the road, tells how the traffic tests were made, and gives the summary of conclusions of the engineers in charge of the tests.

Tractor—The Holt 10-ton "Caterpillar" tractor, of 40 drawbar h.p. is illustrated and described by a folder issued by The Holt Mfg. Co., Inc., Peoria, Ill. Full specifications are given.

Asphalt Tool and Surface Heaters—The Chausse line of oil-burning tool and surface heaters for repairing asphalt pavements is fully illustrated and described in a pamphlet of 8, 7½x10½-in. pages, issued by the Chausse Oil Burner Co., 206 Lincoln Bldg., Detroit, Mich.

Trailers—The LaPlant-Choate tractor trailers are adequately illustrated and described in a pamphlet of 4, 9x12-in. pages issued by the LaPlant-Choate Mfg. Co., Cedar Rapids, Iowa. These trailers are used on many large jobs to reduce hauling costs.

Material Testing Machines—The Tinius Olsen testing machines for testing road-building materials are illustrated and described in an attractively printed folder issued by the Tinius Olsen Testing Machine Co., 500 N. 12th St., Philadelphia, Pa. These machines show the strength and other qualities of cement, concrete, brick, pipe, sand, stone and various other road-building materials. Tests for compression, tension, shear and transverse strengths are readily made. Qualities of resistence to penetration, impact, abrasion, expansion and contraction are easily ascertained.

Patching surface breaks on suburban highway with Tarvia

"Eternal Maintenance is the Price of Good Roads"

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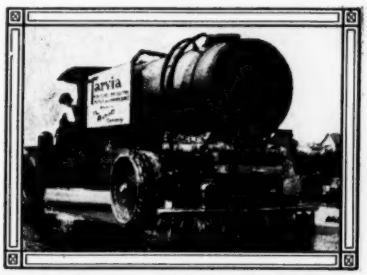
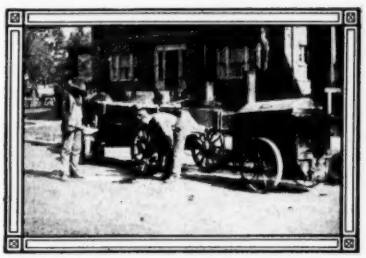
Surface-treating with Tarvia and pea-gravel covering over brick pavement



Tarvia maintenance Truck applying Tarvia



Patching macadam street with Tarvia

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Combustion Equipment—The Combustion Engineering Corp., Broad St., New York, N. Y., has issued a pamphlet giving a condensed description of all their products, including the Frederick stoker, Lopulco pulverized fuel systems, Coxe traveling grate stoker, Quinn fuel oil burner, Lopulco coal dryer, ash conveyors, chain grate stokers, preheaters, grates, oil torches, etc.

Water Works Supplies—The "Michigan" line of water works supplies is described in a 12-page pamphlet issued by the Michigan Valve and Foundry Co., Detroit, Mich. This is the "Flower" line and includes: fire hydrants, water gates, valve boxes, sleeves, valves, indicator posts, sluice gates, check valves, foot valves, grey iron castings, etc.

Heavy Duty Pavers—The Koehring line of Heavy Duty Pavers is illustrated and described in detail in catalog No. 24, recently issued by the Koehring Co., 31st and Concordia Sts., Milwaukee, Wis. This is a very handsome catalog of 48, 8x11-in. pages and several folding plates illustrating the various pavers in this line. All the special features of design and construction are fully explained and pictured. There are numerous interesting views of the pavers in action on the job.

PUBLICATIONS RECEIVED

Recommended Building Code—The Portland Cement Association has contributed to the movement for better building codes a compilation of the latest available information relating to building construction. This compilation is in the form of a Recommended Building Code for cities of 25,000 to 150,000 population. This code, which is based upon a study of a large number of America's building codes, including the code of the Industrial Commission of Wisconsin, has already been adopted in its entirety, or with only minor changes, by a number of communities. In the hands of those engaged in studies of existing codes this Recommended Code will prepare the ground for an intelligent revision and will save a great deal of time and effort. Copies may be obtained by addressing Portland Cement Association, 111 West Washington St., Chicago, Ill.

Concrete Data for Engineers and Architects—This is a booklet of 16, 8½x11-in. pages, dealing with certain important factors in making good concrete. It is issued by the Portland Cement Association, 111 West Washington St., Chicago. The principles set forth in it are based on data compiled from many thousands of tests made at the Structural Materials Research Laboratory, under the direction of Prof. D. A. Abrams, at Lewis Institute, Chicago. The essential principles embodied in this booklet are: Well-graded aggregates, less mixing water, proper and complete mixing, careful placing and proper curing, or protection, after placing. These principles are important to all upon whom the duty of making concrete may depend, but the relation of one to the other or of any individual principle to the resulting mass, has been many times overlooked. A study of these essentials will convey in a short, concise manner, the practical application of Professor Abram's principles. The use of any one of these will make a better concrete, more resistive to the loads imposed or conditions met. They make for greater usefulness of concrete without materially affecting the methods commonly used in construction. The two factors most often neglected and the ones representing the greatest sacrifice in ultimate strength of the concrete are: Too much mixing water and the lack of protection, or curing, of the newly placed concrete.

Sewage Works Operation—The proceedings of the New Jersey Sewage Works Association for 1922 and 1923 have been published and make a booklet of 32, 7½x10½ pages. In addition to the minutes of the seventh and eighth annual meetings, there are papers and discussions on the following subjects: Operation of Pennypack Creek Sewage Treatment Works, Philadelphia; Progress Report on the Sewage Experiment Substation, New Brunswick; Maintenance of Sewer Systems; Some Sewage Experimental Work Accomplished and Under Investigation at the Sewage Substation, New Brunswick; The Licensing of Superintendents and Operators of Sewage Treatment Plants in New Jersey; Superfluous Sewage Treatment Works; Odors from Sewage Disposal Plants. Also there is given the Constitution of the Association and a list of its officers and members. This is a valuable booklet for sewage works operators, city officials and engineers. Nonmembers may obtain copies at $1 each by writing the Secretary of the Association, Mr. Myron E. Fuller, 36 E. Mt. Airy Ave., Philadelphia, Pa.

Contracts Awarded

ROADS AND STREETS

Ala., Montgomery—W. C. Hill, Birmingham, awarded contract by State Hwy. Comn., for grading and surfacing with chert 16 miles Oneonta-Village Springs Rd., 20 ft.., at $127,264.

Ala., Montgomery—State Hwy. Dept.let contracts to grade, etc., 3 roads as follows: St. Clair Co. conc. road bet. Birmingham and Gadsden, Sec. A; 16.286 miles to Phillips & Co., Birmingham, at $175,570; Sec. B, 15.717 miles to Donahue & Co., Tuscaloosa, at $177,490; 5 culvts. and bridges to W. C. Howton, Contg. Co., at $49,196; Crenshaw Co., 12.647 mi. gravel from Brantley to Covington Co. line to Fountain & Myers, Hattiesburg, Miss., at $254,234.

Cal., Los Angeles—Jahn & Bressi, 618 Laughlin Bldg., City, award. contract for impvt. of Hill St.-Washington to Santa Barbara Ave., at $283,750; Geo. H. Oswald, 366 E. 58th St., awarded contract for impvt. of San Pedro St.—61st to Manchester Ave., at $136,236; Bob Bosko, 208 W. 2d St. awarded contr. for impvt. of 1st alley west of State St. bet. 3d and 4th, at $3,599, also 1st alley west of Oxford—Maplewood to Oakwood, at $3,983; Wm. Liddington, 420 E. 60th St., awarded contr. for paving alley so. of Hollywood Blvd.—Van Ness to Bronson Aves., at $2,071; Griffith Co., 502 L. A. Ry. Bldg., awarded contract for impvt. of Bluff Pl.—39th to 40th Sts., at $7,084; Florence Ave.—Wright Rd. east to Compton-Jaboneria Rd., at $48,775;; Los Angeles Sy.—Main Ave. to Azusa Canyon Rd., at $28,500; Ducey & Breitenstein, 151 S. Hill Ave., Pasadena, awarded contract for paving Worcester Ave., Pasadena.

D. C., Washington—Warren F. Brenizer Co., 101 York Ave., N. E., Washington, D. C., awarded contract for 35,000 to 40,000 sq. yds. cement walks, at $83,000.

Fla., Bunnell—Barber & Fortin, Gainesville, awarded contract by State Rd. Dept., Tallahassee, to construct 5 miles concrete road in Flagler Co., Proj. 507, at $186,869.

Fla., Panama City—Crouch Constr. Co., Dothan, Ala., awarded contract for constr. of 30,000 sq. yds. street paving, at $100,000.

Fla., Vero—Clark & Sons, Lemon City, Fla., awarded contract for 7 miles of street paving and curbing, at $148,848.13.

Ga., Atlanta—State Highway Dept. let contracts for 3 projects as follows: No. 228, Hall County, 12 miles bet. Gainesville and Lulu, Cont. 1, 1 mi. concrete to Whitley Constr. Co., La Grange, Ga., at $32,346; Contr. No. 2, R. G. Chambers, West Point, Ga., at $129,940; 114, Ware Co., 7.064 miles penetration macadam bet. Waycross and Folkston to Sam Finley, at $91,456; 232, Dougherty Co., 7.06 miles asphalt bet. Albany and Thomasville to Ely Construction Co., at $113,157.

Ga., Thomasville—Adams-Evans Co., Jacksonville, Fla., awarded contract for street and sidewalk paving at about $100,000; vit. brick with 4-in. cement conc. base, sand cushions and asphalt filler.

Ga., Columbus—C. G. Kershaw Contracting Co., Birmingham, Ala., awarded contract for underpass for 11th St., at $109,000.

Ga., Tybee—Dixon Contracting Co., awarded contract for 4.3 miles oil asphalt paving, including 3rd, Main, Chatham Ave. and First Sts., at $103,800.

Ill., Springfield—Following contracts let by Dept. Pub. Wks. & Bldgs., Div. of Hwys.: M. Hayes & Son, 634 Rookery Bldg., Chicago, Ill., 4.93 mi. Massac Co., at $114,587; Tompeter & Sons, Peru, Ill., at $12,722, 0.38 mi., LaSalle Co.; Monmouth Gate & Mfg. Co., at $20,718, 1.02 mi. Warren Co.; Chas. E. Hamilton, Carbondale, Ill., at $135,850 for 6.06 miles, Saline County; Cameron-Joyce-Smith-Elder Co., Keokuk, Ia., 3.70 mi. Stark Co., at $87,583. These are all pavement contracts on Rts. 1, 7, 8, 13 and 30, respect., F. A. Projects 55, 7, 57 and 64, respectively. Following grading contracts let: 0.30 mi. Christian Co., to H. E. Haun, Richview, Ill., at $1,763, 0.47 mi. Christian Co., $2,473 and 0.49 Christian Co., $5,677; 2.12 mi. Macon Co., at $17,827 to Wm. Amman, Decatur, Ill.; 2.67 mi. McLean Co. to Cameron-Joyce & Co., Keokuk, Ia., $17,565; 3.61 mi. Rock Island Co. to Jenner Bros. & Co., 1120 W. Lombard St., Davenport, Ia., $23,060; 1.18 mi. Greene Co. to Armstrong Engr. Co., Taylorville, Ill., at $15,013; 6.80 and 7.92 miles, Randolph Co., to Tritt Bros., Belleville, Ill., at $74,767; Armstrong Engrg. Co. also received contr. for 3.92 mi. Richland-Clay Cos., at $41,107; 1.37 mi. Marion Co., to Henry G. Althoff, Teutopolis, Ill., at $21,509; 2.08 mi. Christian Co. to Armstrong Engrg. Co., Taylorville, Ill., at $23,951; 2.18 mi. Wayne Co., N. Frazier, Louisville, Ill., at $14,590; 4.13 mi. Henry Co. to E. P. Olson, St. Joseph, Mo., at $36,049; Wm. O'Neil Sons Co., Faribault, Minn., awarded contract for paving 3.66 mi., Rock Island Co., at $83,185; Alzina Constr. Co., Springfield, Ill., 4.55 and 2.10 mi., Sangamon Co., at $133,696; Powers-Thompson Constr. Co., Joliet, Ill., at $63,964, for 3.06 mi., Will Co.

Ind., Indianapolis—McCoun Constr. Co., Noblesville, awarded contr. for conc. paving, 78,643 sq. yds. Northwestern Ave., at $196,643.

Ia., Clarinda—Geo. W. Condon, 510 Farnam Bldg., Omaha, Neb., awarded contract for 320,194 c.y. excav., 18c on F. A. P. 137; 309,630 yds. excav., 18c on F. A. P. 178.

Kans., Valley Falls—McGuire & Cavender, Leavenworth, awarded contract for street improvements, at $104,120.

Ky., Central City—Hornaday Construction Co., 1261 Central Ave., Memphis, Tenn., awarded contract for 30,500 lin. for conc. curb and gutter; also 49,500 sq. yds. rock asphalt pavement on stone macadam, at $189,500.

Mass., Boston—M. F. Roach, E. Bridgewater, awarded contract by St. Hwy. Comn., for sand and asph. surfacing 8 miles of highway through Edgartown and Tisbury, at $142,484.

Mass., Boston—C. B. Lindholm, Pittsfield, awarded contract by State Hwy. Dept., for 1.399 miles, Proj. 103, and 16,910 sq. yds. rein. conc., at $96,712.

Mass., Boston—Coleman Bros., awarded contract for laying bitulithic pavement in Spring St.—Centre Street to the Charles River, West Roxbury, at $79,544.

Mass., Boston—D'Onfro Bros., 712 Main St., Leominster, contract for paving 22,130 ft. road, 20 ft., in Brimfield, Bitum. macadam, at $235,508.

Minn., Fergus Falls—W. E. Kennedy Co., 97 Broadway, Fargo, awarded contract for Paving Proj. 2, at $70,880.

Mich., Frankfort—Marsman & Tabor, Grand Rapids, Mich., awarded contract for paving, at $89,048.

Mich., Grosse Pointe—R. R. Moran, local, awarded contract for paving (9-in.), excavating and curbing, at $90,244.

Mich., Lansing—Wexford County Rd. Commis-

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sion, Cadillac, Mich., awarded contract for Rd. 55-4, Wexford Co., City of Cadillac, F.-Rein.; 20 ft. wide, 1.31 miles, at $19,358; L. I. Goldberg, Traverse City, Mich., awarded contract for F. A. Rd. 104, Mason Co., Pere Marquette and Ambler Twps., F.-Rein., 18 ft. Wide, 5.227 miles, at $98,644.

Mich., Lansing—Federal Aid contracts awarded as follows. Rds. F. A. 69, B, Livingston Co., Village of Fowlerville, F.-Rein., 20-56 ft. wide, 0.635 mi., to H. A. Hoxie, Grand Rapids, at $29,482; F. A. 117, A, Ottawa Co., Spring Lake Twp., F.-Rein., 18 ft. wide, 2.048 mi. to Cline & Boelens, Spring Lake, Mich., at $45,448; F. A. 69, A, Livingston Co., Howell & Handy Twps., F.-Spec. Rein. 20 ft. .wide, 1.785 mi. to H. A. Hoxie, Grand Rapids, at $46,224; F. A. 101, A. B. D., Van Buren Co., Lawrence & Paw Paw Twps., F.-Rein., 20 ft. wide, 5.811 miles, Rd. 101, C. G. and D. S., 2.628 mi. to Kalamazoo Paving Co., Kalamazoo, Mich., at $141,822; F. A. 117, B. & C., Muskegon Co., Norton Twp., F.-Rein., 18 ft. wide, 3,025 miles to G. P. Scharl, Muskegon, $63,972; Rd. F. A. 120, B, Ottawa Co., Wright and Tallmadge Twps., G. & D. S., 0.663 miles to Marsman & Taber, Grand Rapids, at $7,105.

Mich., Saginaw—Midland Contracting Co., awarded contract for foundation and surface, same for surf. only; LaLonde, Eddy & Co., found. only; Chas. G. Milne found. only, and Edwards Construction Co., found. and surf., on 22 streets (asphalt pavement), at total cost of $600,000.

Minn., E. Grand Forks—Johnson, Drake & Piper, 809 1st National-Soo Line Bldg., Minneapolis, awarded contract for paving, constructing curbs, sewer, catch basins, inlets and connections, at $122,130; also similar work in Contr. No. 2, at $32,294.

Mont., Missoula—Sloan & DeCamp and Triangle Constr. Co., Spokane, Wash., awarded contract for Secs. 1 and 2 in 4th of July Canyon near Coeur d'Alene; also surf. Cataldo-Fourth of July project, at $90,000.

Neb., Lincoln—National Constr. Co., 310 Arthur Bldg., Omaha, awarded contract for brick paving on 4½ miles Q Street Rd., at $161,597 and $157,444, respectively.

Nev., Carson City—State Hwy. Dept., let contract for asph. surfacing (macad.) 4.99 miles F. A. P. 64-A from Fallon south, Churchill 2-C-3, Contr. 80, Churchill Co., to Christensen Constr. Co., Palo Alto, Cal.; gravel surfacing 9.16 miles rd. from Deeth east, F. A. P. 54-A-1, Elko, 1-D, Contr. 81, Elko Co. to Strahan, Bishop & Brooks, Sacramento, at $108,773.

N. J., Trenton—J. J. Barrett, 601 Greenwood Ave., awarded contract for paving 22,080 sq. yds. Hamilton Ave., at $102,310.

N. Y., Brooklyn—Brooklyn Alcatraz Asphalt Co., 407 Hamilton Ave., awarded contract for grading, curbing and sheet asphalt paving on Fort Hamilton Parkway here, at $107,281.

N. Y., Fulton—Lane Constr. Corp., 37 Colony St., Meriden Ct., awarded contract for improving and asph. conc. paving several streets here, at $110,675.

N. Y., Hudson—Municipal Constr. Co., U. C. N. Bann Bldg., Utica, awarded contract for paving 39,000 sq. yds. streets, at $108,000.

N. Y., Lockport—W. C. Rich, Youngstown, awarded contract for paving 3.744 miles Creek Rd., Youngstown, conc., at $82,324; 2.86 mi. Sec. 3, Lockport Rd., Pendleton and Cambria, stone, 4.107 mi. Twn. Line Rd., conc., 4.162 mi. Sec. 2, Creek Rd., Pendleton, conc., and resurfacing 1.47 mi. Saunders-Settlement Rd., Cambria, to L. H. Gipp Constr. Co., Buffalo, at $95,788, $139,944 and $40,583, respectively; 6.01 mi. in Middleport, to J. D. Neahl, Cambria, at $23,230.

N. Y., St. George—J. E. Donovan, 2205 Richmond Terrace, Port Richmond, awarded contract for repaving Richmond Rd., granite blk., at $107,613.

O., Euclid—Contract for grading, curbing and asphalt paving on Mallard Rd. E. Bowne Ave., Shoreview, Overlook and Oriole Drives, to Gould & Maybach, 823 E. 150th St., Cleveland, $174,009; 11,600 sq. yds. Cushman Rd., Bell & Iddings Aves., to H. G. Herring, Pavers Exch., Cleveland, $60,224; Bayard and Chelsea Rds., Sunnycliff Aves. to Cleveland Trinidad Paving Co., The Arcade, Cleveland, at $173,115.

O., Cleveland—River Construction Co., 2402 Mapleside Rd., awarded contract for grading, curbing and paving 1,220 sq. yds. Gray Ave., brick on conc., at $5,743; resurfacing 8,400 sq. yds. E. 82d St., asph. to Bentley Bros., Union Bldg., at $24,250; improving Union Ave., 8,700 lin. ft. stone curb, 9,700 lin. ft. 4-in. tile drain gutter, 9,080 c.y. earth excav. and 22,890 sq. yds. vit. brick on conc., to A. M. Pajso Paving Co., Euclid Heights Blvd., Cleveland Hts., at $145,970.

O., Columbus—O. M. Junk, Chillicothe, awarded contract for constructing 5 miles hwy., Jackson County, concrete, at $137,974; R. K. McNamara, Delaware, awarded contract for grading and bitum. waterbound macadam 4.69 mi. Franklin-Delaware Co. line Rd., 16 ft., at $71,226.

Okla., Okla. City—State Hwy. Dept., let contracts for 5 road projects as follows: Washington Co., 6 miles one course plain cement conc., F. A. P. 15, to Hamilton Constr. Co., Bartlesville, at $199,104; Pittsburgh Co., 3 sects. one course plain cem. conc.; 7.42 miles bet. Savanna and Kiowa, F. A. P. 79; Gibson & Mitchell, Pauls Valley, at $230,756; 5.66 mi. from McAlester no., F. A. P. 80, to Green-Beekman, Okla. City, at $116,869; 3.84 mi. from Hartshorne to Latimer Co. line, F. A. P. 81, to Smith Bros., Dallas, Tex., at $170,114; Carter Co., 2.93 mi. one course plain cement conc. from Ardmore east, F. A. P. 89, to Southern Construction Co., at $84,090.

Okla., Tulsa—H. L. Cannaday & Co., awarded contract for 10 paving contracts, at $178,455; also two at $4,258.

Pa., Harrisburg—Highway Construction Co., Philadelphia, award. contract for paving with bitum. macadam penetration method on reconstructed base, 17,858 ft., Rte. 161, Coal Twp. Northumberland Co., 32,236 sq. yds. paving, to Highway Constr. Co., Philadelphia, at $70,605; 35,567 sq. yds. 6-in. rein. conc. resurfacing on Rte. 230, Heidelberg Twp., York Co., to W. T. Staats, 5403 Diamond St., Phila., at $127,825.

Pa., Rockwood—Owen & Plummer, Inc., Otto Bldg., Johnstown, awarded contract for grading, curbing and conc. paving on 4 miles Market St., at $162,000.

R. I., Ashland—Water Supply Bd., City Hall, Providence, relocating Plainfield Pike by means of 65-ft. causeway across Scituate Reservoir here, 5,000 sq. yds. dry earth and 2,000 c.y. dry rock excavating, 230,000 c.y. borrow, 10,000 c.y. broken stone, 28,000 c.y. riprap, 4,000 bbls. cement, 120,000 lbs. steel and 3,000 c.y. rein. conc. for culvert to T. F. McGovern, 95 Main St., Southbridge, Mass., at $288,400.

R. I., Providence—A. D. Bridges Sons., Inc., Hazardville, Conn., awarded contract for rein. conc. paving, at $232,605.

R. I., Providence—Lane Constr. Corp., 37 Colony St., Meriden, Ct., awarded contract by St. Bd. Pub. Rds., Providence, for 3.13 miles rein. conc. paving F. A. P. 17, Div. A in No. Providence and Lincoln Hwy. Contr. 2304, at $153,986.

Tenn., Elizabethton—Clint. Moore, Columbia, Tenn., awarded contract for 14 miles 14-ft. asph. conc. rd. from Wash. Co. line to Sullivan Co. line via Elizabethton. Est. cost, $350,000. Carter Co. has $140,000 available; State to furnish remainder.

Tenn., Martin—Murphy & Hall, Martin, Tenn., awarded contract for 10,000 sq. yds. rock asphalt, 115,000 sq. yds. penetration, 50,000 line ft. curb and gutters and storm sewers, etc., at $190,000.

Tenn., Nashville—State Dept. of Hwys. and Pub. Wks. let following contracts: 14.7 mi. cem. conc., Madison Co., at $484,000; to same firm at $105,000 for brdgs. over 20-ft. span; Montgomery Co. 2 sects.; 2.2 mi. bitum. penetration surf. on coarse stone base, F. A. P. Nos. 94 and 16, to Morse Constr. Co., Nashville, Tenn., at $130,000;; Grundy Co., 21.2 miles grading, draing. and burnt slate surfacg. bet. Monteagle and Altamont, F. A. P. 114, to Brown Contracting Co., Chattanooga, Tenn., at $196,000; Overton Co. 2 sections to Boyd Williams, Murfreesboro, Tenn.; 13.24 mi. F. A. P. 117, at $35,000; 12.06 miles bitum. macadam surfacing on

hand-placed base, bet. Livingston and Putnam Co. line, S. A. P. 118, at $157,000.

Tex., Tyler—Smith County let following contracts: Surface 1.57 mi. State Hwy. No. 15, F. A. P. 115; 11¼ mi. St. Hwy. 15, F. A. P. 147; 7.4 mi. St. Hwy. 37—Swan north through Lindale to Hanna Constr. Co., Waco, Tex., and Finley Constr. Co., Atlanta, Ga., at $89,000.

Va., Richmond—McGuire & Rolfe, Richmond, Va., awarded contr. to pave Broad St., west of Laurel, with sheet asphalt, at $185,000.

Wash., Seattle—Fiorito Bros., awarded contract for paving Greenwood Ave. paving, at $216,249.

Wis., Whitehall—Following contracts let by Wis. Hwy. Comn., for road work in Trempealeau Co.: 1—Blair-Ettrick Rd. Proj. 43, Ed Knutson, La-Crosse, $20,692; 2—Blair-Ettrick Rd. to Henry Nelson, Osseo, $32,967; Wilson-Knapp Rd., Dunn Co. to Tilseth & Ofstie, Menomonie, $21,488; Sherry-Auburndale Rd. Wood Col Proj. 353, W. E. Ule, Stevens Point, at $93,105; Milladore-Blenker Ed. to W. E. Ule, at $10,472; Bear Creek-New London Rd. Proj. 138, Waupaca Co. to Universal Engineering Co., Eau Claire, at $19,256, grading Janesville-Footsville Rd., Rock Co., to Peter P. Gerry, Evansville, at $8,396.

Wyo., Cheyenne—State Hwy. Comn., let contract for grading, surfacing, etc., 5.3 miles Yellowstone Hwy., "Glendo-South," F. A. P. 142-A, Platte Co., to S. L. Smith, Henry, Neb., at $31,190; 4 mi. Lincoln Hwy.—Medicine Bow River to East Co. Line, F. A. P. 148, Carbon Co., to Ames Braisted Constr. Co., Laramie, at $27,871; 9.2 miles Newcastle-Moorecroft Rd., F. A. P. 151-A, Newcastle Co., to Wickham Bros. & Swigert, Lovell, at $84,523.

SEWERAGE AND SEWAGE TREATMENT

Ark., De Queen—Campbell & Heinght, Dallas, Tex., awarded contract for extension of sewer system, at $42,314.

Cal., Pasadena—Frederickson & Shannon, 325 Cory Bldg., Fresno, awarded contract for constr. of vit. pipe sewer of 8-in. to 16-in. diam., in various streets, including Arroyo Blvd.—Washington to Montana Sts.; also portions of Dakota, Zanja, Hammond, Blake, Forest Cypress, Winona and Pasadena Ave.; also other streets in Northwest section of city. Work involves 85,000 lin. ft., or 16.5 miles sewer pipe, ranging in size from 8 to 16-ins.; 3,322 Y branches and 4-in. house sewers; 299 manholes and 70 flush tanks, at $137,409.

Conn., Hartford—Following contracts let: 3,206 ft. rein. conc. pipe for New Britain Ave. in Ward Pl. to Lock Joint Pipe Co., 165 Bway., N. Y. City, $11,209; laying 2,000 ft. pipe in Ward Pl. and 2,000 ft. in New Britain Ave. to Oneil Bros., 983 Main St., at $9,216 and $19,101, respectively.

Fla., Miami Beach—J. B. McCrary Co., Atlanta, Ga., awarded contract for constructing approx. 7 miles sanitary sewers at $85,149; and at $21,993 for constr. of about 1 mile storm sewers.

Fla., Vero—I. C. Mishler, Chattanooga, Tenn., awarded contract for installing storm sewer, at $38,927.

Ind., Hammond—Shea & Co., Hammond, award. contract for sewerage system, at $87,000.

Kan., Sterling—Burt & Tripp, Hutchinson, awarded contract for san. sewerage system: 53,112 ft. pipe, 8-in., $0.45, 10-in. $0.55, 12-in. $0.70, etc., total $62,570.

La., Rayville—McIntosh Constr. Co., Oklahoma City, Okla., awarded contract for constr. of sewer system, at $50,000.

Mich., Detroit—Lennane & McIlvenna, 1121 Book Bldg., awarded contract for Conners Creek sewer Sec. 3, 5 centered conc. arch, at $663,285.

Mo., Maplewood—(St. Louis, P. O.) Frazier-Davis Constr. Co., Arcade Bldg., St. Louis, award. contract for 15,640 ft. 8-36-in. vit. clay and 500 ft. 42-in. segmental block sewer in Manchester Sewer Dist., 2, at $97,156.

Mo., Trenton—Tom Johnson, Eagle Grove, Iowa, awarded contract to construct san. sewer in Dist. 25, at $39,902.

N. J., E. Orange—C. Ippolito, 252 Main St., awarded contract for 7,500 ft. 24 and 30-in. sewer in William St., at $101,473.

N. J., Hightstown—Hennessey & Sowell, Collingwood, awarded contr. for alterations and additions to sewage disp. plant, at $51,450.

N. J., Long Branch—H. L. Harrison, 31 Clinton St., Newark, award. contract for sewerage sys. with sedimentation tank, in northwesterly section of city, at $47,000.

N. Y., Brooklyn—Sewer in Church St. awarded to Necaro Co., Inc., 97 Court St., at 100.97% of engineer's est. ($269,436); 64th St. to M. Tozzi, 1362 63d St., 88.75% ($7,145); 83d & Lake Sts. to Nazzaro & Querriero, 88% ($6,586) and 87.79% ($4,609), respect.; E. 31st St. to Tomasetti & Co., Inc., 1133 60th St., 86% ($4,834); Sedgwick Pl., 54th St. and 2 sections of E. 10th St. to Manmill Constr. Co., 2035 Douglas St., 97% ($2,443), 98% ($3,602), 87.5% ($1,600) and 87.5% ($1,600) respect.; Beverly Rd., to J. McBride, 100% ($400).

N. Y., Mamaroneck—Mapes & Erway, Little Britain, Rd., Newburgh, awarded contract for completing sewage disposal works. Engineer's est., $100,000.

N. Y., Long Isl. City—Seaside Contg. Co., 193 Beach 108th St., Rockaway Beach, awarded contract for storm sewer in 32d Ave., at $125,786.

N. Y., New York—Following contracts let: Sewer in Jarvis Ave. to McDonald & Wilson, at $5,669; Pelham Parkway to Anita Constr. Co., 2975 Marion Ave., at $40,042; Tryon Ave. to Spadero & Turlano, 3185 E. Tremont Ave., at $5,417.

N. Y., N. Y. City—Melrose Constr. Co., 103 E. 125th St., awarded contract for sewers in West Side of Amsterdam Ave.—W. 190th St. to Ft. George Ave., at $55,000.

N. Y., New York Mills—D. Perritanp, 1832 Rutger St., Utica, award. contract for san. sewer system, at $86,500.

N. Dak., Casselton—Haggart Constr. Co., Fargo, awarded contract for sewers and water works, at $55,669.

O., Dayton—C. F. Smith & Son, 54 Davies Bldg., awarded contract for mains in Oakwood Hts. Sewer Dist., southern sec.), at $121,609; Connelly Bros., Cincinnati, at $41,470 for northern section.

O., Euclid—C. W. Jackson, 1318 E. 84th St., Cleveland, awarded contract for 110 ft. 6-in. conc. and 975 ft. 24-in. tile trunk inlet sewer in Lake Shore Blvd. and Bliss Rd., at $35,247.

Pa., Erie—F. G. Diefendorf, Erie, awarded contract for Mill Creek Valley monolithic sewer drain, at $43,006; F. G. & H. G. Diefendorf, Erie, awarded contract for 11 sewers in Frontier Pl., Subdiv. 5, at $16,285; 6 to Doyle Contg. Co., Erie, at $16,661.

S. Dak., Yankton—J. Jensen, 2407 Wirst St., Omaha, Neb., award. contract by St. Bd. Charities & Correc., Pierre, for 20,650 lin. ft. 12 and 15-in. sewers at State Hosp. here, at $31,544.

Tex., Ft. Worth—McKenzie Constr. Co., awarded contract for construct. 2 additional filter beds to sewage disp. plant, at $400,000.

Wis., Marshfield—Pastoret Constr. Co., 506 Sellwood Bldg., Duluth, Minn., awarded contract for sewers, at $70,235.

WATER SUPPLY AND PURIFICATION

Ark., De Queen—Ladd Construction Co., Kansas City, Mo., award. contract for extension of water works system, at $45,014.

Cal., Long Beach—U. S. Cast Iron Pipe & Foundry Co. awarded contract for furnishing Water Dept. with 15,000 ft. 30-in.; 10,000 ft. 20-in.; 5,280 ft. each 12, 8 and 7-in. sizes cast iron pipe, at $268,367.

B. C., Duncan—Donald Cameron, 864 Hamilton St., North Vancouver, awarded general contract for water works system for Town, at $45,000. Work will consist of about 2½ miles excavating and pipe laying.

Ont., Toronto—Following contracts let by York Township: 6 and 12-in. cast iron mains for water works system, at $50,025; hydrants to J. T. Hepburne, Ltd., 18 Van Horne St., $2,238; valve chamber covers to Dominion Wheel and Foundries, 131 Eastern Ave., $3,508; 6 and 12-in. gate valves to Drummond McCall Co., 373 Front St., E., $8,660; cast iron spcls., to J. T. Hepburne, at $2,270; laying mains in Almeda, Pope and Donlands Ave., to G. Thompson, 40 Jarvis St., $5,000; in Eglington, Grey and Hamsbad Aves., to C. E. Smith, 180 Fern Ave., at $1,440.

Kan., Herrington—Burt & Tripp, Herrington,

awarded contract for water works impvts., at $176,078 (on basis of conc. paving on dam slope).

La., Lecompte—Following contracts let for light and water works plant: Machinery to Fairbanks-Morse Co., 608-14 Magazine St., New Orleans, at $23,475; reservoir, conc. found. and building, to Hayden Constr. Co., Pass Christian, Miss., at $4,000; $15 per c.y. and $75,000 respectively; water well to Gray Artesian Well Co., at $4,000.

Md., Baltimore—Simplex Valve Co., 5722 Race St., Philadelphia, Pa., awarded contract for furnishing rate controllers and Venturi meters for Montebello filtration plant, at $40,626.

Md., Baltimore—Kennedy Valve Mfg. Co., 116 E. Miller St., Elmira, N. Y., awarded contract for valves for Water Dept., at $56,365; stand. valves to A. P. Smith Mfg. Co., Norman St., East Orange, N. J., at $64,601.

Md., Frostburg—Wentworth & Co., Cumberland, awarded contract for building reservoir, at $44,900.

Mich., Detroit—National Construction Co., 1031 Dime Bank Bldg., awarded contract for 52x130 ft. pumping sta., with 40 ft. well, rein. conc., 5 electrically operated centrif. pumps, two 24-in., two 15-in. and one 12-in., provision made for additional pumping units as needed. Contract price, $177,700.

Mo., Kansas City—U. S. Cast Iron Pipe & Fdry. Co., 604 Interstate Bldg., awarded contract for 1,200 tons 8-in. pipe, at $70,980.

Mo., King City—Beeson Machinery Co., Kansas City, Mo., award. contract to erect water works plant, at $50,340.

Mo., Kirksville—E. K. Ladd Construction Co., Kansas City, Mo., award. general contract for water works system, at $83,215; contract for clear water well and filter bed bldgs. to Carothers Constr. Co., Kans. City; filter equipment to be furnished by Bacharach Co., Kansas City, at $7,567; valves and hydrants to Ludlow Valve Co., Kansas City, at $8,334.

N. Y., Fairport—Following contracts let: 16-in. pipe and fittings to Central Foundry Co., Jersey City, N. J., at $155,540; laying above pipe to Pittsburgh-Des Moines Steel Co., Corry Bldg., Pittsburgh, Pa., at $47,990; rapid sand rein. conc. filtration plant to Norwood Engrg. Co., Florence, Mass., at $12,737; 30 ft. standpipe to Chicago Bridge & Iron Wks. Co., 608 Dearborn St., Chicago, Ill., at $7,500; earthen dam to Hines & McCabe, Rochester, at $68,020.

N. Dak., Casselton—Haggart Construction Co., Fargo, awarded contract for water works and sewers, at $55,669.

O., Cleveland—Joseph Co., 877 Orange Ave., awarded contract for 1,045 tons cast iron mains in Random Rd. Contr. 31, at $146,245.

Tenn., Madisonville—Fred Cantrell, Chattanooga, Tenn., awarded contract to construct water works system here, at $38,000.

Tex., Austin—Jno. B. Hawley (Hawley & Sands), Ft. Worth, awarded contract by city to design and construct filtration plant. Approx. cost, $240,000; capy., 8,000,000 gals. per day. Will probably vote on bonds.

Tex., Baird—J. U. Johnson, Eastland, Tex., awarded contract in conjunction with J. W. Moore, Lampasas, Tex., to install water works system here, at cost of $45,000.

Tex., Edgewood—Municipal Eng. Co., Praetorian Bldg., Dallas, awarded contract for water works and street lighting systems, at $40,000 and $15,000, respectively.

Tex., Ft. Worth—City let following contracts for South Side pumping plant: West & Womack, Ft. Worth, for constr. of building, at $17,999; Conner & Hudson, Dallas, Tex., at $14,996 for machinery; $30,000 to Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa., for tank; constr. of plant will begin in 30 days.

Prospective Work

ROADS AND STREETS

Ala., Clanton—State Hwy. Dept. Montgomery, will probably let contract latter part of August to grade, drain and surface 34 miles Birmingham-Montgomery Hwy. through Chulton Co. Approx. cost, $1,000,000. W. S. Keller, State Hwy. Engr., Montgomery. J. H. Mayor, Div. Engr., Birmingham.

Ala., Montgomery—State Hwy. Dept. plans to construct 3 road projects as follows: Clay Co., 14 miles topsil rd. from Lineville toward Heflin; Cherokee Co., 11 mi. gravel rd. from Center to Etowah Co. line, via Leesburg; Etowah Co., 1.1 miles conc. or other hard surf. rd. from corp. limits of Ala. City toward Gadsden. W. S. Keller, St. Hwy. Engr.

D. C., Washington—Expenditure of $716,724 of forest road funds for constr. of Colorado and Idaho roads has been approved by Secy. Wallace. In Colorado, $325,824 will be expended on the Berthoud Pass, Red Mountain, Cameron Pass, Independence Pass Roads; in Idaho, $390,000 on about 106 miles hwy., including Lolo Pass rd., North Pacific Hwy., Kootenai-Peck River rd.; Warren wagon rd.; Warme River-Yellowstone hwy.; Lowman-Stanley rd.; Strawberry-Sharon project and Ketchum-Clayton road.

Fla., Key West—Chamber of Commerce and Rotary Club interested in bldg. 111 miles roadway from Key West to mainland at Florida City.

Fla., Panama City—City plans to expend $333,333 for street improvements here.

Fla., St. Petersburg—City plans to expend $2,612,000 for impvts., including following: Street paving, $1,500,000; bridges, $79,000; incinerator, $90,000; storm drainage, $463,000; san. sewers no. of 9th Ave., in downtown district; also high sch. dist., $305,000. Other impvts., $175,000. For detailed information, address Director of Public Works.

Fla., Sarasota—Sarasota County plans impvt. of 4 roads as follows: Widen, straighten and repair portion of Tamiami Trail no. and so. through County; complete road east and west through County to DeSoto Co. line, via Fruitville and Verna; extend rd. southeast from Bear Ridge across Myakka River to DeSoto Co. line; build rd. connecting Laurel with Tamiami Trail. Considering voting on $400,000 to $450,000 bonds.

Ga., Camilla—Mitchell County plans to rebuild road from Camilla to Colquitt County line. Est. cost, $80,000.

Ga., Cordele—Crisp County plans to grade and lay pebble base found. on 2 sections of roads as follows: Natl. Hwy. bet. Cordele and Dooly Co. line, $180,000; hwy. from Dooly to Turner Co. line, $350,000. Jno. S. Sheppard, Chmn. Bd. Co. Comnrs.

Ind., Terre Haute—Vigo County plans to lay conc. paving on Co. Rd. 10; 34,128 sq. yds. Sec. 1 and 29, 862 sq. yds. Sec. 2, $107,297 and $93,258, respectively; Co. Unit Rd. 9, 54,000 sq. yds. Sec. 1 and 48,310 sq. yds. Sec. 2, $138,444 and $131,698, respectively. R. E. Gibbons, Terre Haute, Engr.

Ky., Frankfort—State Hwy. Dept. plans grading etc., 3 roads as follows: Magoffin Co., 11.32 mi. Salyersville-West Liberty rd., from Salyersville to Morgan Co. line; Harlan Co., 27.8 mi. Harlan-Whitesburg rd., St. Proj. No. 6; Fayette Co., 1 mile Lexington-Georgetown rd., State Proj. 5. Will include 6 types of surfacing. Joe S. Boggs, State Hwy. Engr.

Ky., Frankfort—State's apportionment of Fed. Aid road funds for fiscal year beginning July 1 will be $1,228,125.29.

La., Mansfield—DeSoto Parish plans completing from 100 to 200 mi. hard surfaced roads. Contemplates $1,000,000 bond issue.

Mich., Ironwood—Plans made for grading, graveling and paving as follows: 9 mi. graveling so. of Watersmeet, $47,000; 18 mi. grav. S. W. of Covington, $34,000; 9 mi. grav. no. of Amasa, $14,000; 4 mi. gradg. no. Seney, $18,000; 8 mi. pavement from Marquette to Negaunee; 1 mile pavement at Negaunee, $19,000. H. L. Davies, Dist. Engr. Escanaba.

Minnesota—Following counties have authorized issuance of bonds for road impvts.: Carlton Co., $175,000, N. C. Nickerson, Carlton, Engr.; Steel Co., $250,000, R. W. Hosfield, Owatonna, Engr.; Wabasha Co., $100,000, G. A. Larson, Wabasha, Engr.; Carver Co., $250,000, L. A. Zeman, Chaska.

BUYERS' GUIDE

Aerial Tramways.
American Steel & Wire Co.

Air Lift Pumps.
Harris Air Pump Co.

Armor Plates.
Truscon Steel Co.

Asphalt.
Bitoslag Paving Co.
The Barrett Co.
Pioneer Asphalt Co.
Standard Oil Co. (Indiana)
The Texas Co.
Uvalde Asphalt Paving Co.
Warren Asphalt Paving Co., The

Asphalt Filler.
The Barrett Co.
Bitoslag Paving Co.
Standard Oil Co. (Indiana)
The Texas Co.
Warren Bros. Co.

Asphalt Floors.
The Barrett Co.
The Texas Co.
Warren Bros. Co.

Asphalt Machinery.
Chausse Oil Burner Co.
Cummer & Son Co., The F. D.

Asphalt Plants.
Austin Machinery Corporation.
Cummer & Son Co., The F. D.
Littleford Brothers.
Warren Bros. Co.

Asphalt Railroad Plants.
Cummer & Son Co., The F. D.
Warren Bros. Co.

Asphalt Tools.
Chausse Oil Burner Co.
Littleford Brothers.
Warren Bros. Co.

Asphalt Tool Wagons.
Chausse Oil Burner Co.
Littleford Brothers.

Auto Fire Apparatus.
Kissel Motor Car Co.
International Motor Co.
Lewis-Hall Iron Works.
Packard Motor Car Co.
Pierce-Arrow Motor Car Co.

Back Fillers.
Austin Machinery Corporation.
Pawling & Harnischfeger.

Bar Cutters and Benders.
Koehring Machine Co.

Bars, Reinforcing.
Truscon Steel Co.

Binders, Road.
The Barrett Co.
Pioneer Asphalt Co.
Standard Oil Co. (Indiana)
The Texas Co.
Uvalde Asphalt Paving Co.
Warren Bros. Co.

Bituithic Pavements.
Warren Bros Co.

Blasting Accessories.
E. I. du Pont de Nemours & Co., Inc.

Blasting Powder.
E. I. du Pont de Nemours & Co., Inc.

Bodies.
Lee Trailer and Body Co.
Littleford Brothers.

Braces, Extension.
Kalamazoo Fdy. & Machine Co.

Brick Rattlers.
Olsen & Co., Tinius.

Brick-Testing Machinery.
Tinius Olsen Testing Mach. Co.

Bridges.
Lewis-Hall Iron Works.

Buckets, Dredging, Excavating and Sewer.
Pawling & Harnischfeger.

Buckets, Dumping.
Littleford Brothers.
Pawling & Harnischfeger.

Cableway Accessories.
Sauerman Bros.

Cableway Excavators.
Sauerman Bros.

Calculators.
Kolesch & Co.

Car Unloaders.
Austin Machinery Corporation.
Heltzel Steel Form & Iron Co.

Castings.
U. S. Cast Iron Pipe & Fdy. Co.

Cast Iron Pipe.
U. S. Cast Iron Pipe & Fdy. Co.

Catchbasins.
Dee Co., Wm. E.
Madison Foundry Co.

Cement Testing.
Kirschbraun, Lester.

Cement Testing Machinery.
Tinius Olsen Testing Mach. Co.

Central Heating Plants.
American District Steam Co.

Chimneys, Concrete.
Truscon Steel Co.

Chimneys, Steel.
Lewis-Hall Iron Works.
Littleford Brothers.

Chloride of Lime.
Pennsylvania Salt Mfg. Co.

Chutes, Concrete.
Heltzel Steel Form & Iron Co.
Littleford Brothers.

Concrete Mixers.
Austin Machinery Corporation.
Koehring Machine Co.
Smith Co., T. L., The

Concrete, Reinforcement.
American Steel & Wire Co.
Truscon Steel Co.

Conduits.
Cannelton Sewer Pipe Co.
Carey Co., Philip, The.
Truscon Steel Co.

Conduit Rods.
Stewart, W. H.

Consulting Engineers.
Alvord, John W.
Artingstall, Wm.
Brossman, Chas.
Burd & Giffels.
Chicago Paving Laboratory.
City Wastes Disposal Co.
Dow & Smith.
Fargo Engineering Co.
Flood, Walter H., & Co.
Hill, Nicholas S., Jr.,
Howard, J. W.
Hunt & Co., Robert W.
Jones, Sam L.
Kirchoffer, W. G.
Kirschbraun, Lester.
Luten, Daniel B.
Potter, Alexander.
Van Trump, Isaac.
Wells, James P.

Contractors.
City Wastes Disposal Co.
Sullivan, Long & Hagerty.
Warren Bros. Co.

Contractors' Tools and Machinery.
Austin Machinery Corporation.
Austin-Western Road Machinery Co.
Good Roads Machinery Co., Inc.
Koehring Machine Co.
Littleford Bros.
Smith Co., T. L., The

Contractors' Wagons.
Austin Machinery Corporation.
Austin-Western Road Machinery Co.

Conveying Machinery.
Mead-Morrison Mfg. Co.
Pawling & Harnischfeger.
Portable Machinery Co., Inc.
Webster Mfg. Co.

Cranes and Hoists.
Austin Machinery Corporation.
Heltzel Steel Form & Iron Co.
Pawling & Harnischfeger.

Creosote.
The Barrett Co.
Republic Creosoting Co.

Creosoted Wood Block.
(Factory Floors, Bridge Floors)
Republic Creosoting Co.

Crushers, Rock and Ore.
Austin-Western Road Machinery Co.
Good Roads Machinery Co., Inc.

Culvert Pipe, Vitrified.
Cannelton Pipe Co.
Dee Clay Mfg. Co., Wm. E.

Culverts.
Austin-Western Road Machinery Co.
Newport Culvert Co.
Truscon Steel Co.

Curb and Gutter Forms.
Heltzel Steel Form & Iron Co.
Truscon Steel Co.

Curb Bar.
Truscon Steel Co.

Direct Oxidation Process.
Direct Oxidation Process Corp.

Drag-Line Excavators.
Austin Machinery Corporation.

Drag Scrapers.
Austin-Western Road Machinery Co.

Drain Tile.
Dee Clay Mfg Co., W. E.

Drawing Materials.
Kolesch & Co.

Dryers.
Cummer & Son., The F. D.

Dump Cars.
Austin-Western Road Machinery Co.

Dump Wagons.
Austin-Western Road Machinery Co.

Engr.; Meeker Co., $180,000, G. H. Martz, Litchfield, Engr.; Dodge Co., $50,000, D. P. Poboisk, Mantorville, Engr.; Goodhue Co., $250,000, J. A. Prior, Red Wing, Engr.; Beltrami Co., $250,000, S. D. Snyder, Bemidji, Engr.; Nicollet Co., $100,000, H. W. Daniels, St. Peter, Engr.

Miss., Vicksburg—Warren Co. plans bldg. and improving 6 roads as follows: 7.6 mi. 16-ft. gravel, No. Scenic Hwy. to Haynes' Bluff, at cost $170,000; 5.75 mi. 16-ft. gravel, No. Scenic Hwy.—Haynes' Bl. to Issaquena Co. line, $116,000; 6.5 mi. 12-ft. gravel Fisher's Ferry Hwy.—Hall's Ferry rd. to Fisher's Ferry brdg. on Black River, $45,000; repair old Valley rd., $5,000; 6 mi. 12-ft. gravel Oak Ridge Exten. from Oak Ridge to Yazoo Co. line, $45,000; 1.35 mi. 14-ft. gravel, No. Scenic Hwy. no. end from Haynes' Bl. to Yazoo Co. line, $62,000; also several bridges planned.

Mont., Glasgow—Resolution passed appropriating $13,000 to aid in constr. of Fed. Rd. Proj., Fort Peck Ind. Reservation bet. Nashua and Frazer. Total cost, $143,000. 15 miles 24-ft. wide, grading and graveling. Co. Surv. Manson H. Bailey; L. E. Bretzka, Aud. Valley County.

Mont., Helena—Expenditures totaling $342,000 of national forest highway funds for 5 road bldg. projs. in state, approved by Secy. of Agriculture. One proj. calls for constr. of 10½ mi., Lincoln Co. bet. Warland and end of Fed. Aid Hwy. This lies within Kootenai national forest; $100,000 approved for impvt.; to add 5 mi. to Bolton-Java rd. in Flathead national forest, $100,000 authorized. This sec. will be 19 mi. long. $92,000 authorized for exten. of present forest hwy. within Gallatin national forest, 8 mi. so. to point abt. 8 miles no. of Yellowstone natl. park boundary. Constr. of 5 mi. hwy. in Sanders Co. west from Weeksville up to one of the main east and west highways through Montana has been authorized and $80,000 appropriated. For making location survey of 4 mi. Yellowstone Canyon Hwy., $4,000 authorized.

Nev., Schulyer—Town will pave about 30 blocks of streets this year. Amos. Svoboda, City Clk.

Nev., Carson City—Following projects will soon be advertised: Proj. No. 15, 7 mi. gravel, Elko Co., No. 25, 5 mi. gravel, White Pine Co., No. 70, 2.10 mi. 18-ft. conc. and gravel, White Pine Co.; No. 58, Rose Creek underpass, Humboldt Co., No. 22, Shoshone Point underpass, Eureka Co. and No. 37, Apex underpass, Clark Co.—all concrete. Plans have been completed on following: No. 55, 10.25 mi. 10-ft. gravel, Churchill Co., 81, City of Elko, 1.94 mi. conc. and gravel, Elko Co.; 70, City of Ely, White Pine Co., 1.55 mi. conc. & grav; 25, 5 mi. gravel surf. White Pine Co.; 15, 7 miles gravel surf. Elko Co., 85, 27 mi. gravel surf. Lincoln Co. Plans being prepared for following: No. 52, 18 mi. gravel surf. Clark Co. across Mormon Mesa; 53, 10 mi. grav. surf. Clark Co. Mormon Mesa to State line; 12 mi. gravel surf. Eastgate to E. County line, Churchill Co. (No. 56); 73, Lawton to 2 mi. east Verdi, Washoe Co., 4.5 mi. grav. and conc. surface; 82, Winnemucca to Golconda, Humboldt Co., 15.5 mi. gravel surf.; 76, City of Winnemucca, Humboldt Co., 2.4 miles gravel surf.; 83, City of Las Vegas, Clark Co., 3.20 mi. conc. and gravel; 65-R, Sparks to Hafed, Washoe Co., 7 miles conc. and gravel.

N. J., Trenton—State Highway Dept., Trenton, plans to improve approaches to all state institution, $194,000; also rd. bet. Trenton and Princeton, concrete, $600,000, both in Mercer Co. Construct 10 miles hwy. bet. Swainton and Cedar Sprgs., Cape May Co.; est. cost $500,000. W. G. Sloan, State Hwy. Engr.

Okla., Tulsa—City plans to expend $187,178 to pave streets in Dists. Nos. 479 to 494.

S. C., York—York County plans hard surfacing rds. in County. Contemplates voting on $2,000,000 bonds. L. A. Harris, Secy. Co. Hwy. Comn.

Tex., Austin—State Hwy. Dept., has approved plans for bldg. 14.8 miles 18-ft. gravel road on State Hwy. 12, Hidalgo Co.—Mamie to Star County line. Est. cost, $165,489. J. E. Epperson, Co. Judge, Edinburg.

Tex., Breckenridge—Stephens County plans to expend $100,000 to place hot top surface on 2 miles Bankhead Hwy. near here; also for other road impvts.

Tex., Carizzo Springs—Dimmitt Co. plans 87 miles of rd. impvt., including 56 miles State Hwy. No. 12-B from Cotulla to Waverick Co. line, through Big Wells and Carizzo Springs and following lateral roads; 9 mi. from Carizzo Sprgs. to Asherton; 12 mi. from Asherton to Brundage; 10 mi. on Crystal City rd. from Carizzo Springs to Zavalda Co. line. Considering voting on $450,000 bonds.

Tex., Center—City Comn. will take bids this summer for paving public square; also various streets. Est. cost of impvts., $125,000. P. A. McCarthy, Lufkin, Engr.

Tex., Edinburg—Hidalgo County plans to build 13.92 miles 18-ft. bitum. macadam rd. on State Hwy. 12 bet. Edinburg and Alamo. Approx. cost, $474,776; Fed. Aid, $100,000. P. S. Devine, Co. Engr., Pharr, Tex.

Tex., Ft. Worth—Tarrant County plans 7 miles hard surfaced rd. on State Hwy. 10. Est. cost, $165,000; State Hwy. Comn., granted $124,500 State and Fed. Aid. B. A. Davis, Co. Engr.

Tex., Kountze—Secy. of Agriculture, U. S. Bureau of Pub. Rds., Wash., D. C., has approved plans for 15 miles 16-ft. gravel road on S. H. No. 8, Beamont-Silsbee rd. from 2 miles no. of Jefferson Co. line to Jasper Co. line, Hardin Co., F. A. P. 354. Est. Cost, $167,903. Geo. C. Brown, Co. Engr.

Tex., Laredo—Webb County plans to lay bitum. surfacing on various roads: Est. cost, $225,000. Reese Spence, Dist. Engr., Tex. Hwy. Comn., San Antonio, Rex. Co. Commrs., Laredo.

Tex., Marlin—Falls County plans 19 miles 18-ft. gravel rd. on State Hwy. 44, bet. Chilton and Milam Co. line. Approx. cost, $320,000. W. S. Hunnicut, Co. Judge, Marlin; J. P. Wehrung, Engr., Lott.

S. Dak., Pierre—State Hwy. Comn. contemplates grading 33.95 miles rds. in Jones, Hutchinson, Brown and Fall River Cos. Est. cost, $179,032. D. D. Hudgins, State Hwy. Engr.

Wash., Olympia—Dept. of Agriculture has authorized expendts. of $106,000 for constr. of 16 mi. hwy. in this state. Of this amt., $46,000 is allotted for construction of Baker river rd., Washington Natl. forest. Total of $50,000 is for work on middle fork Snoqualmie hwy., while $10,000 will be used on Mt. Baker rd. in Washington national forest.

Wash., Seattle—Board of King County Commrs. has voted approval of paving Maple Valley Hwy. up to Cedar river valley—Renton to point nr. Elliott—approx. 3 miles. Pavement will be 20 ft. in width, 7 ins. thick at center and 6 ins. on edges. An amt. in excess of $100,000 is available for the improvement. Plans nearing completion in office of Co. Engr., Reginald H. Thomson.

W. Va., Charleston—City plans to expend bet. $175,000 and $200,000 to pave about 33 streets. Will probably vote on bonds latter part of August. Harold Matthews, Chmn. of Street Comn.

W. Va., Huntington—City plans resurfacing with sheet asphalt 3d Ave.—8th to 23d Sts., will also let contract to pave 14 streets in various sections including 7th, 9th, 25th, etc. A. P. Maupin, City Engineer.

SEWERAGE AND SEWAGE TREATMENT

Ark., McGehee—City having plans prepared for installation of sewer system. Work will consist of more than 11 miles pipe, pumping sys. to get sewage to treatment plant and constr. of treatment plant. Est. cost, about $100,000. H. L. Shannon, Mayor. M. Z. Baer, Chf. San. Engr.

Cal., Orange—$200,000 bonds voted to cover cost of city's participation in the "Four City Pact" sewage disposal system. Santa Ana has voted $500,000; Anaheim, $300,000, and Fullerton, $200,000.

Cal., Beverly Hills—$140,000 bonds voted at recent election. Funds will be used for sewer mains, laterals, treatment plant, disposal works, machinery, etc.

Cal., Oakland—City will appropriate $208,000 for sewers in Yerba Buena Ave., $103,500 outlet sewer in 7th St.; $70,000 storm sewers in Fruitvale Ave.; $40,000 outlet sewers in Piedmont St., $10,000 san. sewers in Fruitvale Ave.; $85,000 storm sewers in Elmhurst Dist.

Ont., Stamford Twp.—Twp. Council will submit by-law to ratepayers shortly for expendt. of ap-

BUYERS' GUIDE

Dust Laying Compound.
The Barrett Co.
Standard Oil Co. (Indiana)
The Texas Co.

Dynamite.
E. I. du Pont de Nemours & Co., Inc.

Edge Protector.
Truscon Steel Co.

Electrical Wires & Cables.
American Steel & Wire Co.

Elevating Graders.
Austin-Western Road Machinery Co.

Elevators.
C. H. & E. Mfg. Co.

Engineering Instrumentś.
Kolesch & Co.
Lufkin Rule Co., The

Engines.
C. H. & E. Mfg. Co.

Excavating Machinery.
F. C. Austin Machinery Co.
Pawling & Harnischfeger.
Sauerman Bros.
Smith Co., T. L., The

Expansion Joint Compound.
The Barrett Co.
Carey Co., Philip, The
Pioneer Asphalt Co.
Truscon Steel Co.

Explosives.
E. I. du Pont de Nemours & Co.

Fence, Iron.
Cincinnati Iron Fence Co.

Fillers (Paving Joint).
The Barrett Co.
Carey Co., Philip, The.
Pioneer Asphalt Co.
The Texas Co.

Fire Brick.
Cannelton Sewer Pipe Co.
Dee Clay Mfg. Co., W. E.

Flue Liners.
Cannelton Sewer Pipe Co.
Dee Clay Mfg. Co., W. E.

Forms, Sidewalks, Curb & Gutter.
Heltzel Steel Form & Iron Co.
Truscon Steel Co.

Forms, Road.
Heltzel Steel Form & Iron Co.
Truscon Steel Co.

Forms (Sewers & Conduits).
Heltzel Steel Form & Iron Co.

Forms (Wall Bldg., Construction, Etc.).
Heltzel Steel Form & Iron Co.

Gas Pipe.
U. S. Cast Iron Pipe & Fdy. Co.

Graders.
Austin-Western Road Machin-
Good Roads Machinery Co., Inc.
ery Co.

Granite Block.
Granite Paving Block Mfrs. Assn. of the U. S., Inc.

Gravel Screener and Loader.
Good Roads Machinery Co., Inc.
Jordan & Steele Mfg. Co., Inc.

Heaters (Rock and Sand).
Littleford Bros.

Heating Plants, Central.
American District Steam Co.

Heating Wagons (Oil and Tar).
Good Roads Machinery Co., Inc.
Littleford Bros.

Hoists (Concrete, Gasoline and Hand).
Pawling & Harnischfeger.

Hoists, Electric.
Mead-Morrison Mfg. Co.
Pawling & Harnischfeger.

Hoists, Steam.
C. H. & E. Mfg. Co.
Lewis-Hall Iron Works.
Mead-Morrison Mfg. Co.

Hot Mixers.
F. C. Austin Machinery Co.

Incinerators.
William F. Morse.

Inlets (Sewer).
Dee Co., Wm. E.
Madison Foundry Co.

Insulating Material.
The Barrett Co.
Pioneer Asphalt Co.

Joint Fillers (Paving).
The Barrett Co.
Carey Co., Philip, The.
The Texas Company.

Kettles (Portable).
Cummer & Son Co., The F. D.
Good Roads Machinery Co., Inc.
Littleford Brothers.

Manhole Covers.
Madison Foundry Co.
Dee Co., Wm. E.

Mastic.
The Barrett Co.
Pioneer Asphalt Co.

Meter Boxes.
McNutt Meter Box Co.

Mixers, Asphalt.
Austin Machinery Corporation.
Cummer & Sons Co., The F. D.

Mixers, Concrete.
Austin Machinery Corporation.
Koehring Machine Co.
T. L. Smith Co.

Mixers—Mortar.
C. H. & E. Mfg. Co.

Molds (Pipe & Culvert).
Heltzel Steel Form & Iron Co.

Motor Fire Apparatus.
Acme Motor Truck Co.
Duplex Truck Co.
Federal Motor Truck Co.
Garford Motor Truck Co.
International Motor Co.
Kissel Motor Car Co.
Packard Motor Car Co.
Pierce-Arrow Motor Car Co.

Motor Trucks.
Acme Motor Truck Co.
Duplex Truck Co.
Federal Motor Truck Co.
International Motor Co.
Kissel Motor Car Co.
Packard Motor Car Co.
Pierce-Arrow Motor Car Co.

Motor Truck Flushers, Sprinklers and Oilers.
Acme Motor Truck Co.
Austin Machinery Corporation.
Duplex Truck Co.
Federal Motor Truck Co.
Garford Motor Truck Co.
The Gramm-Bernstein Motor Truck Co.
International Motor Co.
Kissel Motor Car Co.
Packard Motor Car Co.
Pierce-Arrow Motor Car Co.

Municipal Castings.
Dee Co., Wm. E.
Madison Foundry.

Packing.
Pioneer Asphalt Co.

Paints (Asphalt).
Barrett Co., The
Pioneer Asphalt Co.

Paving Blocks (Creosoted).
The Barrett Co.
Republic Creosoting Co.

Paving Brick.
Medal Paving Brick Co.
Metropolitan Paving Brick Co.
Murphysboro Paving Brick Co.
National Paving Brick Mfrs. Assn.
Springfield Paving Brick Co.

Paving Contractors.
Warren Bros. Co.

Paving Joint Compound.
The Barrett Co.
Carey Co., Philip, The.
Pioneer Asphalt Co.
The Texas Company.

Paving Joint Filler.
The Barrett Co.
Carey Co., Philip, The.
Pioneer Asphalt Co.
The Texas Company.

Paving Machines.
Austin Machinery Corporation.
Cummer & Son Co., The F. D.
East Iron & Machine Co., The
Warren Bros. Co.

Paving Plants (Asphalt).
Austin Machinery Corporation.
Cummer & Son., The F. D.
East Iron & Machine Co., The
Good Roads Machinery Co., Inc.
Smith Co., T. L., The
Warren Bros. Co.

Pipe Cutters.
W. W. Stickler & Bros.

Pipe Dip and Coatings.
The Barrett Co.
Pioneer Asphalt Co.
The Texas Co.

Pipe Manufacturers.
U. S. Cast Iron Pipe & Fdy. Co.

Pitch Filler.
The Barrett Co.
Warren Bros. Co.

Plows (Rooter and Wing).
Austin-Western Road Mach. Co.

Portable Paving Plants.
Austin Machinery Corporation.
Cummer & Son Co., The F. D.
Good Roads Machinery Co., Inc.
Littleford Brothers.
Warren Bros. Co.

Portable Stone Bins.
Austin-Western Road Machinery Co.
Good Roads Machinery Co., Inc.

Powder (Blasting).
E. I. du Pont de Nemours & Co., Inc.

prox. $281,571 on Township's sewer system. M. Kerr, Engr. Twp. Hall, Ferry St., Niagara Falls. T. R. Stokes, Clerk.

Ont., Toronto—Works Committee has adopted report of Commr. Harris favoring construction of drainage system for North Toronto, to involve expendt. of $11,125,000. System would include new sewage disposal plant costing $1,000,000.

Fla., Daytona—City contemplates voting on bond issue amounting to $260,000. Included is $100,000 for extension to san. and sewerage systems; also $100,000 for water works impvts., replacments and extensions. R. P. Wilson, Acting City Mgr.

Fla., Miami—City contemplates constr. of storm sewer on W. Flagler St. and W. 12th Ave. Est. cost approx. $117,700. F. H. Wharton, City Mgr.

Ill., Palatine—Consoer Eng. Co., 140 S. Dearborn St., Chicago, Engrs. for sewerage system here. Est. cost, $160,000; Marr, Green & Co., 400 N. Mich. Ave., Chicago, Cons. Engrs.

La., Baton Rouge—City will vote on various bond issues including $325,000 for sewerage; $200,000 for sewerage in suburbs; $325,000 for drainage, etc. J. W. Billingsley, City Engr.

Mich., Detroit—Prelim. plans being made for constr. of Allen drain for newly acquired city zoological gardens—about 2 miles 4-8 ft. brick, segment blk., or monolithic concrete. Est. cost, $300,000. J. W. Reid, City Engr.

Minn., Austin—Pearse, Greeley & Hansen, Chicago, Ill., have made survey for sewer and disposal tank. Hormel & Co., (packers) will help finance. Est. cost, $206,698. F. R. Smith, City Clk.

N. C., Charlotte—City has had prelim. surveys completed for installation of septic tank. Est. cost, $300,000. Will probably vote on bonds. W. S. Stancill, Commr. of Pub. Wks.

N. C., Durham—$100,000 bonds will be issued for extending and enlarging water works and $100,000 bonds for enlarging, extending and improving sewer sys. C. B. Alston, City Clk.

O., Botzum—(Ira, P. O.) City of Akron has purchased site and plans to construct 2-sty. sewage disp. plant here. $1,000,000 bonds voted. Metcalf & Eddy Eng. Co., 14 Beacon St., Boston, Mass., Engrs.

O., Kenmore—City considering construction of sewage disp. plant. Est. cost, $300,000. E. A. Schlegal, Direct. Pub. Service.

Tex., San Angelo—Plans being made for new sewage disposal plant and mains complete, gravity flow, to replace privately owned plant. Est. cost, $150,000 to $200,000. W. T. Mantell, City Engr.

Va., Falls Church—Arlington Board of Supervisors (D. J. Howell, Co. San. Engr.) contemplates installing sewer system to cost $1,000,000.

Wash., Seattle—Funds are to be provided by bond issue for constr. of city sewage disposal plant to purify outfall of Oregon street sewer before it enters Lake Washington. Sites for 20 of the sewage disposal plants, which will eventually be constructed, to handle sewage now emptying into Lake Washington, have been acquired. Oregon St. purification plant will soon be constructed under supervision of W. D. Barkuff, City Supt. of Sts. & Sewers. Plants have governmental and state approval.

W. Va., Bluefield—$850,000 bonds voted for municipal impvts., including san. and storm sewers, etc. Wm. H. Thomas, Mayor.

Wis., Athens—Plans being made for sewerage system and disp. plant. Est. cost, $80,000. W. G. Kirchoffer, Dean Blk., Madison, Engr.

WATER SUPPLY AND PURIFICATION

Ala., Birmingham—Imperial Coal & Coke Co., will install water works system at Bradford Mines with reservoir or standpipe with capy. of 100,000 gals. System will also include septic tank sys. of sewers. Water works system will include one-half mile mains for distribution of water, equipped with liquid chlorine apparatus.

Ala., Mobile—City considering voting on $350,000 bonds for water and sewer systems; also street impvts.

Ark., Texarkana—Texarkana Water Corporation will soon begin construction of 6½ miles 6-in. water main to Arkansas side, cost $90,000. Will also construct 14,000 ft. of additional mains on Texas side, cost about $50,000.

Cal., Beverly Hills—$400,000 bonds voted here for municipal water system, including water rights, reservoirs, tanks, distributing lines, pumping plants, etc. Portion of this issue will be used to purchase franchise and distributing system of Beverly Hills Utility Co. which furnished this section with water.

Cal., El Segundo—El Segundo Water Co., applied to State R. R. Comn. for permission to sell to city its property and distribution sys. for municipal water system. $200,000 bonds voted by city for this purpose.

Cal., Santa Barbara—City Mgr. Fred Johnston has estimated cost of water mains, necessary to be laid before proposed paving program is started, at $177,700.

Cal., Watts—Conservation Water Co., has applied to State R. R. Comn. for authority to issue and sell $250,000 bonds to refund certain securities, and for betterments to plant. Abt. $150,000 will be expended on impvts. About 10 miles cast iron and screw pipe will be laid, including replacements and extensions. New pumps and about 2,000 meters will be installed. W. W. Pedder, 8619 Fir St., Los Angeles, Engineer.

Que., Three Rivers—City considering construction of filtration plant. $200,000. C. Gelinas, City Engr.

Fla., Miami Beach—City will install approx. 9 miles 6 and 8-inch. pipe lines. $100,000 available. H. H. Horn, Supt. of Water Dept.

Ga., Atlanta—Finance Comn., has recommended to city council the issuance of $1,500,000 bonds for water works hydro-electric plant; also extension of city water mains.

Ida., Lewistown—$380,000 bonds voted for water works, including 6,000,000 gal. filtration plant, rein. conc. reservoir, mains, etc. Burns & McDonnell, FIVE—MUN ENG CON NEWS
401 Interstate Bldg., Kans. City, Mo., Engrs.

Ky., Danville—City considering erection of water plant, contingent upon erecting of proposed dam across Dix River by Dix River Power Co. and Midwest Utilities Company of Chicago, Ill. Est. cost of plant, $200,000; daily capy., 4,000,000 gals.; to be operated by electricity. Pearse, Greeley & Hansen, 39 W. Adams St., Chicago, Ill., preparing plans and specfs.

Ky., Louisville—Louisville Water Co., 434 Third St., plans to extend water system to Highland Park and So. Louisville, new cast iron mains, etc. Est. cost, $350,000. G. W. Smith, Pres.

Ky., Owensboro—City considering extending and improving water works system, in order to supply outlying districts. Est. cost, $100,000. Election will be called in November to vote on bonds. J. H. Hickman, Mayor.

Mich., Sturgis—$88,000 bonds voted for new water system here.

Mo., Poplar Bluff—City will probably vote on $100,000 bonds for a filtration plant; also construction of sewer system in E. Poplar Bluff.

N. Y., Clarence—Board of Trade plans to construct water works. Est. cost, $85,000.

N. Y., East Creek—Adirondack Power & Light Corp., 511 State St., Schenectady, plans hydro-electric power development to include dam, power house, penstock, etc., here. Est. cost, $1,500,000.

N. Y., Fairport—$325,000 voted for installing soft water system.

N. C., Elizabeth City—$300,000 bonds will be offered for sale; funds to be used for water, light and sewer plants.

O., Cincinnati—Plans being prepared for conc. reservoir for city water works at construction cost of $400,000.

Tex., Ft. Worth—Dallas County and Tarrant Co. considering joint water project. Plans include constr. of lake to cost $2,000,000, retarding basins on West and Clear forks of the Trinity River, etc. K. Robey, Levee Engr.

Va., Danville—San. Engr., Div. State Board of Health, Richmond, Va., has approved plans for remodeling filtration plant. Will increase capy. to 5,000,000 gals. daily capy.

Wis., Portage—Plans being made to construct brick, rein. conc. and steel filtration plant. Est. cost, $100,000. Pearse, Greeley & Hansen, 39 W. Adams St., Chicago, Cons. Engrs.

BUYERS' GUIDE

Pumps.
De Laval Steam Turbine Co.
Evinrude Motor Co.
Harris Air Pump Company.
Keystone Driller Co.
Smith Co., T. L., The

Reinforcing For Pavements.
American Steel and Wire Co.
Truscon Steel Co.

Road Building Material.
Kentucky Rock Asphalt Co.
The Texas Co.

Road Binder.
The Barrett Co.
Pioneer Asphalt Co.
Standard Oil Co. (Indiana)
The Texas Co.
Uvalde Asphalt Paving Co.
Warren Bros. Co.

Road Forms.
Heltzel Steel Form & Iron Co.
Truscon Steel Co.

Road Graders.
Austin-Western Road Machinery Co., The
Good Roads Machinery Co., Inc.

Road Machinery.
Austin Machinery Corporation.
Austin-Western Road Machinery Co., The
Buffalo-Springfield Roller Co.
Cummer & Son Co., The F. D.
Good Roads Machinery Co., Inc.
Keystone Driller Co.
Littleford Brothers.
Warren Bros. Co.

Road Planer.
Austin-Western Road Machinery Co., The

Road Oil and Preservatives.
The Barrett Co.
Standard Oil Co. (Indiana)
The Texas Co.

Road Rollers.
Austin-Western Road Machinery Co., The
Buffalo-Springfield Roller Co.
Good Roads Machinery Co., Inc.

Rock Crushers.
Austin-Western Road Machinery Co.
The Good Roads Machinery Co., Inc.

Roofing Material.
The Barrett Co.
Carey Co., Philip, The.
Pioneer Asphalt Co.
The Texas Co.
Warren Bros. Co.

Sand Dryers.
Cummer & Son Co., The F. D.
Littleford Brothers.

Saw Rigs.
C. H. & E. Mfg. Co.

Scarifiers.
Austin-Western Road Machinery Co., The
Good Roads Machinery Co., Inc.

Scrapers, Drag Line.
Pawling & Harnischfeger.
Sauerman Bros.

Scrapers, Graders, Plows, Etc.
Austin-Western Road Machinery Co., The

Scrapers, Power.
Sauerman Bros.

Sewage Treatment.
Direct Oxidation Process Corp.

Sewer Braces.
Kalamazoo Fdry. & Mach. Co.
Dee Co., Wm. E.
Madison Foundry Co.

Sewer Cleaning Machinery.
Stewart, W. H.

Sewer Forms.
Heltzel Steel Form & Iron Co.

Sewer Pipe.
Cannelton Sewer Pipe Co.
Dee Clay Mfg. Co., W. E.

Sewer Pipe Joint Compound
The Barrett Co.

Sewer Rods.
Stewart, W. H.

Slide Rules.
Kolesch & Co.

Sluice Gates.
Coldwell-Wilcox Co.

Snow Removal Machinery.
Austin Machinery Corporation.
Good Roads Machinery Co., Inc.
Phoenix Mfg. Co.

Special Castings.
U. S. Cast Iron Pipe & Fdy. Co.

Sprinklers.
Austin Machinery Corporation.
Austin-Western Road Machinery Co., The

Steel Joists, Studs and Sash.
Truscon Steel Co.

Steel Tapes.
Kolesch & Co.
Lufkin Rule Co., The

Stone Crushers.
Austin-Western Road Machinery Co., The

Stone Elevators.
Austin-Western Road Machinery Co., The

Stone Spreaders.
Austin-Western Road Machinery Co., The
Burch Plow Works Co.

Stone Screens.
Austin-Western Road Machinery Co., The
Littleford Bros.

Street Cleaning Machinery (Horse Drawn).
Austin-Western Road Machinery Co., The

Street Paving Material.
The Texas Co.

Street Sprinklers (Horse Drawn).
Austin-Western Road Machinery Co., The

Surface Heaters
Chausse Oil Burner Co.

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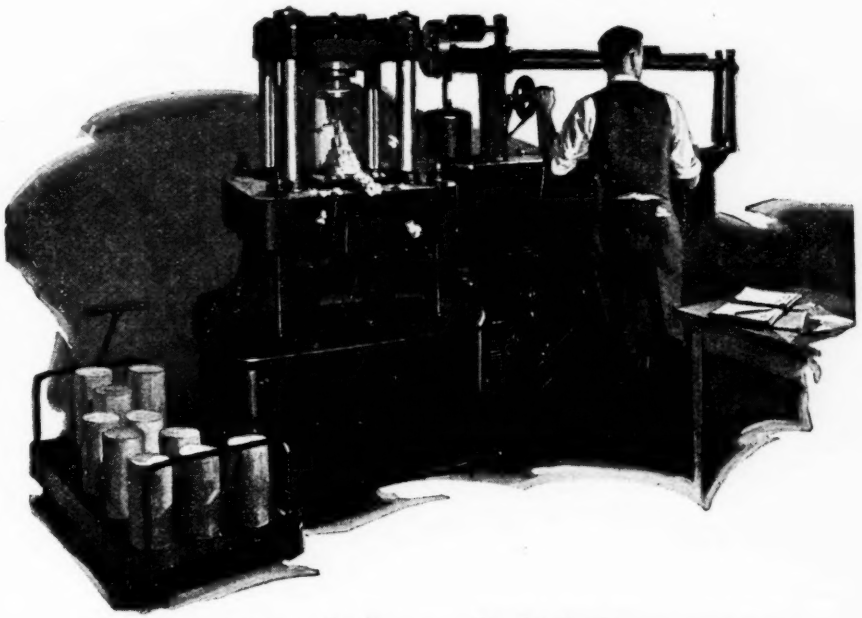

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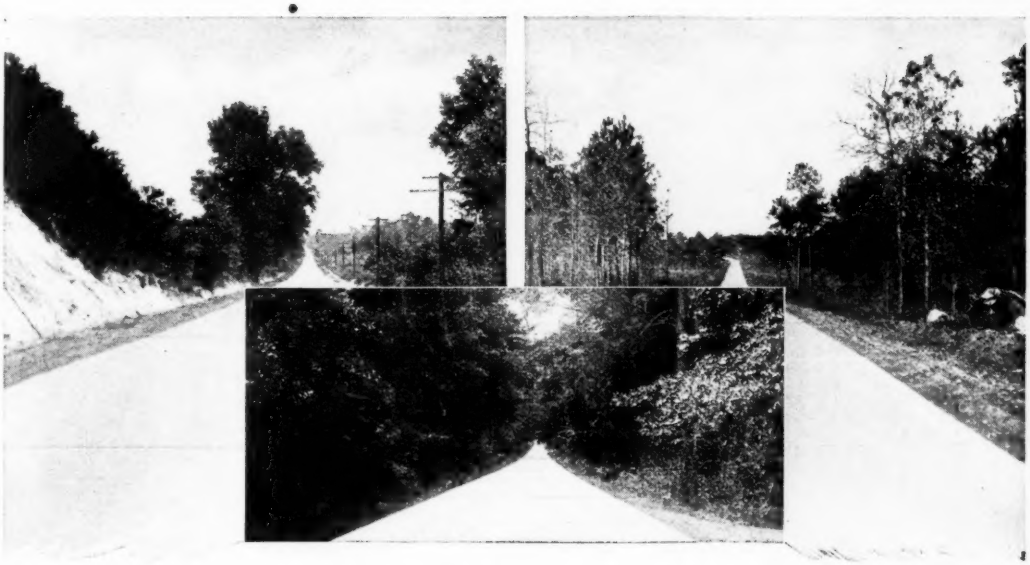

Left—Savannah-Augusta, Ga., road. Dixon Contracting Co., Savannah, Ga., Builders. *Right*—Newberry Road, Richland County, Columbia, S. C. Constructed by Chatham Paving Co., Columbia, S. C. *Center*—Ogeechee Road leading from Savannah, Ga., W. T. Hadlow, Jacksonville, Fla., Builder.

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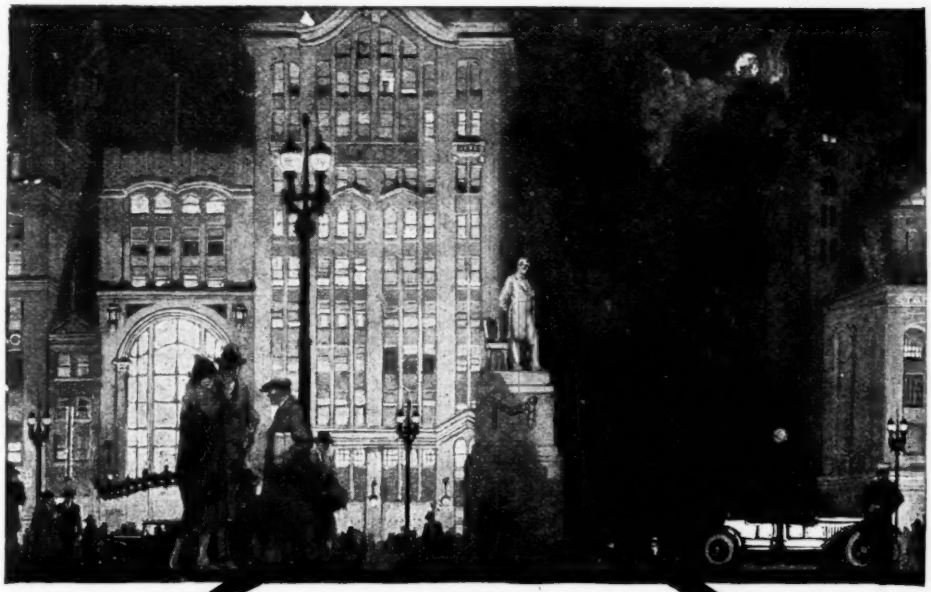

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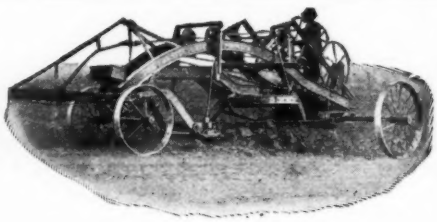

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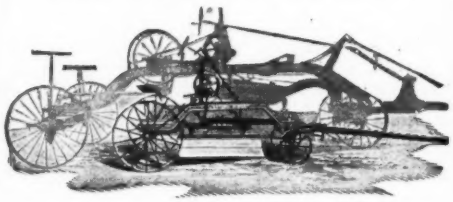

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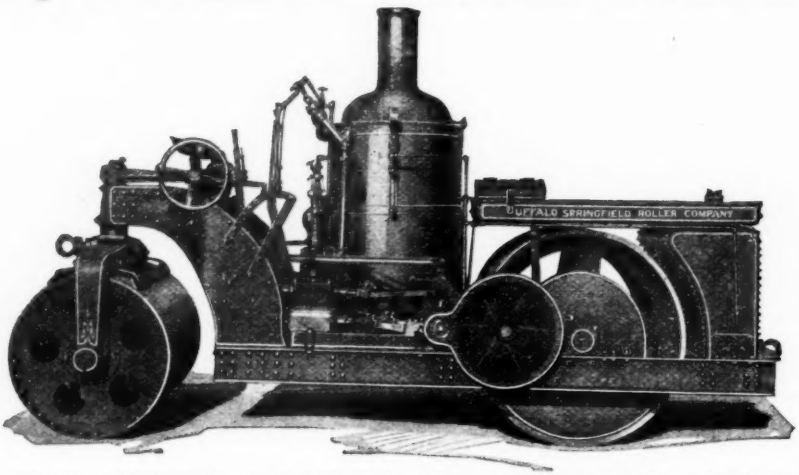

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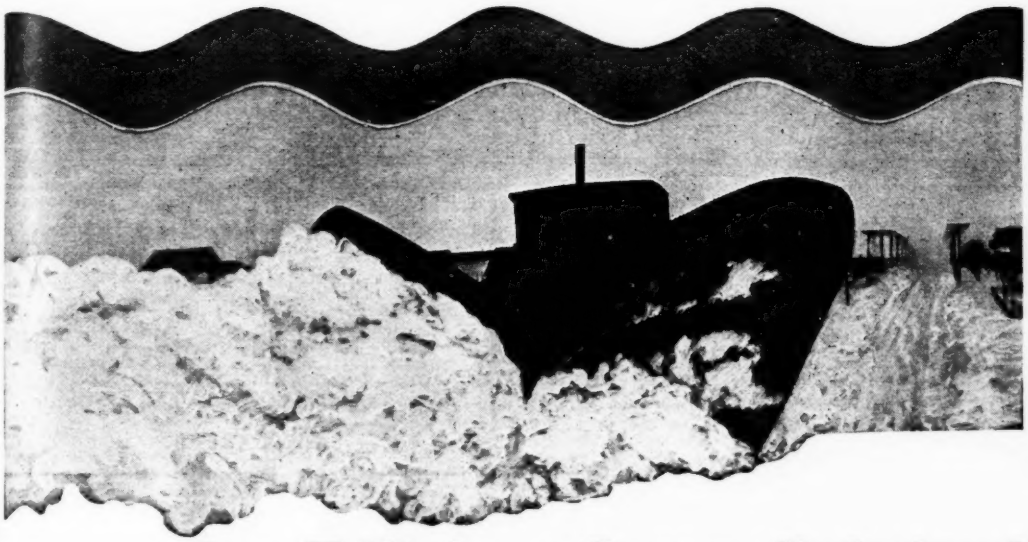

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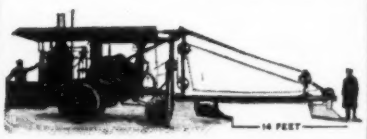

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